SOUTH PEACE FOREST DISTRICT
CARIBOU UNGULATE WINTER RANGE:
BIOLOGICAL REQUIREMENTS AND
MANAGEMENT OBJECTIVES

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EXECUTIVE SUMMARY

This document provides the biological rationale for the designation of woodland caribou winter ranges in the Dawson Creek Timber Supply Area (TSA) and TFL 48. Ungulate winter ranges (UWR) for caribou populations were determined based on known caribou habitat use within the region. Habitat use and winter biological requirements were determined from past and current caribou studies in the region, consultation with regional biologists and species experts, as well as using literature collected from other northern ecotype caribou studies. A total of 17 caribou UWR areas have been proposed based primarily on known caribou use and biological requirements. Ungulate winter range areas have been designated as high or medium priority ranges, or corridor areas. High priority ranges have evidence of both past and current caribou use, where as medium priority ranges do not have documentation of current caribou use. Corridor areas have been identified as critical areas that facilitate the movement of caribou between high priority winter ranges.

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1. INTRODUCTION

The British Columbia Ministry of Water Land and Air Protection (MWLAP) is responsible for developing Ungulate Winter Ranges (UWR) and establishing UWR management objectives and General Wildlife Measures. The Forest and Range Practices Act (FRPA) enables the Lieutenant Governor in Council to make regulations authorizing the MWLAP to establish UWRs and to set objectives with respect to forest and range practices for UWRs (Sections 149 and 149.1). Part 10, Division 1, Section 107 (1) and (2) of the Forest Planning and Practices Regulation (FPPR) enables the Minister of Water, Land and Air Protection, by order, to establish and set objectives and general wildlife measures for UWRs. "Ungulate Winter Range" is defined as an area identified as critical/necessary for the winter survival of an ungulate species. As such, UWR objectives and general wildlife measures consider key life requisites including thermal cover, security cover, forage sources, and potential risk factors such as road access. Under the FRPA, objectives for General Wildlife Measures for UWR are required to provide guidance to Forest Stewardship Plans (FSPs), Range Stewardship Plans (RSPs), and other operational plans. In addition, the Ministry of Forests (MOF) holds the authority for approval of FSPs, RSPs, and other operational plans under the FRPA. These operational plans will be required to be consistent with objectives set by government, including those for UWR. A FSP, RSP, or other operational plan will be required before timber harvesting, road construction, or livestock grazing can occur on Crown land, unless otherwise prescribed or exempted in legislation.

This UWR initiative is for northern ecotype Woodland Caribou (*Rangifer tarandus caribou*) within the Dawson Creek Timber Supply Area and TFL 48, Peace Forest District, Prince George Forest Region of British Columbia. The following report entails a review of existing information on northern ecotype caribou winter habitat requirements, with a clear and defensible rationale for the selection of UWR units and associated recommended management. The overall objectives are to:

- identify the areas necessary for winter survival of caribou and,
- ensure these areas are distributed effectively for maintaining caribou across their current range, and

The Dawson Creek Timber Supply Area (TSA) is situated in northeastern British Columbia and is comprised of approximately 2.3 million hectares of land. The TSA is bounded on the north by the Peace River, to the east by the Alberta border, and to the south and west by the Front Ranges and the Hart Ranges, respectively. The TSA falls primarily within two ecoprovinces: the Boreal Plains and the Sub-boreal Interior Ecoprovinces. A small portion of the Eastern Continental Ranges ecoregion covers the extreme southern portion of the planning area. Five ecosections occur within the planning area: the Peace Lowlands, Kiskatinaw Plateau, Hart Foothills, Peace Foothills, and Hart Ranges. Biogeoclimatic zones within the TSA include Black and White Spruce (BWBS), Engelmann Spruce-Subalpine Fir (ESSF), Sub-boreal Spruce (SBS), and Alpine Tundra (AT). In general, this area is characterized by long, cold winters and a short growing season.

2. METHODS

Ungulate winter range areas were selected based on biological information obtained from available literature sources specific to caribou in the Peace region, past and current research projects in the region, and consultation with regional wildlife biologists, foresters and managers. The following report discusses the biological requirements and delineates ungulate winter range areas based on the requirements of northern caribou and expert opinion of northern caribou populations within the Dawson Creek TSA and TFL 48.

The timing of the winter season has been widely defined, but for the purpose of this proposal winter dates will follow that described by Jones et al. (2004). Jones et al. (2004) defined early winter and late winter occurring between October 16 to January 20, and January 21 to April 14, respectively. Habitat zones are discussed throughout this proposal to describe habitat use. Jones et al. (2004) reports the most recent caribou research being conducted within the Dawson Creek TSA/TFL 48, and thus their descriptions of habitat zones will be followed (Table 1).

Table 1. Elevational ranges and descriptions of habitat zones occurring within the Dawson Creek TSA/TFL 48, as described by Jones et al. (2004).

Habitat Zone	Elevation Range	Description
Alpine	Above 1500 m	Treeless habitat
Subalpine Parkland	Above 1500 m	Krummholz trees and alpine meadows
Subalpine Forest	1100-1550 m	Primarily Engelmann Spruce-Subalpine Fir (ESSF)
Low Elevation Forest	Below 1100 m	Low elevation pine-spruce forests primarily in the eastern part of the region

3. BIOLOGICAL RATIONALE

3.1 Species Account Information: Northern Woodland Caribou

Scientific Name: *Rangifer tarandus caribou*
Species Code: M_RATA
British Columbia Status: Blue-listed (any indigenous species or subspecies considered to be of Special Concern in British Columbia).
COSEWIC Status: Threatened (a species that is likely to become endangered if limiting factors are not reversed).

3.2 Distribution

In British Columbia, three ecotypes of woodland caribou have been classified: mountain, northern and boreal (Seip and Cichowski, 1994; Heard and Vagt, 1998). Mountain caribou are primarily found in the southern part of the province, reaching as far north as the Hart Ranges. Mountain caribou utilize high elevation, old growth forests that provide abundant arboreal lichens during the winter months. Northern ecotype caribou winter in low elevation forests that

are characterized by abundant terrestrial lichens. Several populations of northern ecotype caribou, however, also utilize high elevation windswept alpine areas as primary winter range. Northern ecotype caribou are primarily found in the northern part of the province, but also exist in west-central British Columbia and west-central Alberta (Seip and Cichowski, 1994; Seip, 1998). Boreal caribou inhabit the low elevation Boreal White and Black Spruce (BWBS) forests of northeastern British Columbia, and are not known to currently exist within the Dawson Creek TSA/TFL 48.

Within the Dawson Creek TSA/TFL 48, all caribou herds have been classified as northern ecotype based on their habitat use and forage preferences. Five distinct northern ecotype caribou herds have been recognized in the Dawson Creek TSA/TFL 48: Graham, Moberly, Kennedy-Siding, Quintette and Narraway/Belcourt (Cichowski et al., 2004). All five of these herds reside within the Dawson Creek TSA and TFL 48 for at least part of their annual range, and all depend on specific geographic areas and habitat elements during the winter season. The Quintette and Moberly herds remain in the Dawson Creek TSA/TFL 48 for the entire year, while the Narraway/Belcourt and Kennedy-Siding herds move in and out of the region seasonally. Winter ranges for the Graham herd have been previously delineated by Diversified Environmental Services, Fort St. John, BC, and will not be addressed in this proposal.

The winter distribution of caribou is often dependent on specific habitat requirements. Basic winter habitat requirements include windswept alpine, mid to high elevation subalpine forests, and low elevation pine-lichen forests that provide abundant foraging habitat (Seip and Cichowski, 1994; Cichowski et al., 2004). The primary forage species for northern caribou are terrestrial lichens, and distribution and abundance of these lichens will often dictate the use of different habitats by northern caribou (Cichowski et al., 2004).

3.3 General Ecology and Key Habitat Requirements

3.3.1 Winter Habitat Use

Northern caribou populations within the Dawson Creek TSA/TFL 48 make use of two different wintering strategies (Harper, 1988; Cichowski et al., 2004). These include (1) high elevation, windswept alpine areas, and (2) lower elevation pine-spruce forests (Harper, 1988; Cichowski et al., 2004). Choice of wintering strategy largely depends on the geographic area, snow depths and forage availability. Industrial activity may also impact caribou wintering strategies, but this has yet to be shown in studies. Individuals of the Quintette herd make use of both wintering strategies. At least some individuals remain in high elevation, windswept areas for the duration of the winter season, while other animals will migrate out to low elevation boreal conifer forests (Sopuck, 1985; Province of BC, 1990; Murray, 1992; Pate, pers. comm.; Woods, pers. comm.). The majority of animals in the Moberly herd winter on windswept alpine ridges; however, some herds make use of the ESSF forests surrounding the alpine and subalpine parkland areas (TERA, 1995a,b; Jones et al., 2004; Seip, pers. comm.). Caribou in the Narraway/Belcourt area migrate from high elevation summer ranges to lower elevation winter ranges in the pine-spruce forests in British Columbia and Alberta. Some individuals, however, remain in the windswept alpine areas of specific ridges (Bloomfield et al., 1981; Province of BC, 1990; Saher and Schmiegelow, in prep; Saher, pers. comm.). Caribou in the Kennedy-Siding herd make distinct movements to low

elevation pine-lichen forests on the flats near the Parsnip River. The winter range of these animals falls outside the Dawson Creek TSA/TFL 48 and has previously been delineated by the Ministry of Water, Land and Air Protection, Omineca Region, Prince George, and therefore will not be discussed in this proposal.

There is abundant literature available on the winter habitat use of northern ecotype caribou, but this proposal will also draw upon literature and personal communications specific to the caribou in the Dawson Creek TSA/TFL 48. Habitat use of wintering caribou can be defined by several habitat variables including elevation, biogeoclimatic zone (BEC), primary forest cover and stand age (Table 2).

Table 2. Habitat use of northern caribou herds within the Dawson Creek TSA/TFL 48. Habitat use is outlined by elevation, biogeoclimatic zone (BEC), forest cover and stand age preferences.

Herd	Winter Range Type	Elevation (m)	BEC	Forest Cover	Stand Age	Reference
Moberly	High Elevation	1300-2000 m	AT ESSFwk2 ESSFmc3 ESSFmv3	• Primary: Subalpine fir dominated stands • Secondary: Spruce, Pine and Black spruce stands	>121 years	Wood & Hengeveld, 1998 Jones et al., 2004
Quintette	High Elevation	>1500 m	AT ESSFmv2	• Spruce dominated stands • Spruce-subalpine fir stands	80-140 years	Sopuck, 1985 Murray, 1992 Jones et al., 2004
	Low Elevation	600-1200 m	BWBS	• Lodgepole pine • Black spruce swamps	-	Sopuck, 1985 Murray, 1992 Pate, pers. comm.
Narraway/Belcourt	High Elevation	>1500 m	AT	-	-	Stevenson & Hatler, 1985b Province of BC, 1990 Murray, 1992
West-central Alberta	Low Elevation	1300-1500 m	-	• Lodgepole pine • Lodgepole pine/white spruce • Black spruce (muskegs)	120-140 years	Gray & Bloomfield, 1980 Benn & Bloomfield, 1981 Bloomfield et al., 1981 Bjorge, 1984 Edmonds & Bloomfield, 1984

3.3.1.1 High Elevation Winter Range

High elevation winter ranges are characterized by windswept alpine areas that provide low snow depths, and abundant terrestrial lichens and ground forage (Cichowski et al., 2004). Subalpine krummholz habitats are also an important component of the high elevation range as they provide expanded areas of lower snow depths and foraging opportunities. Within the Dawson Creek

TSA/TFL 48, high elevation ranges include the Alpine Tundra (AT) zone, and several variants of the Engelmann Spruce-Subalpine Fir (ESSF) zone including ESSFmv2, ESSFmv3, ESSFmc3, ESSFwk2, ESSFp and ESSFwc3 (Westworth Environmental Associates, 1998; Jones et al., 2004). These areas are generally located above treeline and have little to no timber value, but are extremely important for caribou. They provide large areas that segregate caribou from predators and ungulates that inhabit early seral habitats (TERA, 1995b).

In the Moberly area, caribou make use of all available windswept ridges and open subalpine habitats (Stevenson and Hatler, 1985; Backmeyer, 1991; TERA, 1995a,b; Wood and Hengeveld, 1998; Jones et al., 2004). Wood and Hengeveld (1998) report that caribou winter in areas ranging in elevation from 1280 m to 1790 m. Jones et al. (2004) support this finding, reporting that the Moberly caribou use habitats above 1300 m. Within the Moberly group, however, animals using the Mt. McAllister area have shown increased use of the subalpine forests during the winter (Seip, pers. comm.). For this reason, it is recommended that ungulate winter range around Mt. McAllister include the lower elevation subalpine forests (Jones et al., 2004; Seip, pers. comm.).

The high elevation winter ranges of the Quintette caribou are similar to the high elevation habitats used by the Moberly herd. Winter ranges are generally above 1500 m, and include the tundra steppe as well as subalpine conifer forest vegetation types (Sopuck, 1985; Murray, 1992; Jones et al., 2004). Sopuck (1985) indicated that forested habitats surrounding high elevation alpine areas were used by the Quintette herd in early winter before snow depths became restrictive for feeding and traveling.

Extensive research has been conducted on caribou in west-central Alberta (Benn and Bloomfield, 1981; Bloomfield, et al., 1981; Edmonds and Bloomfield, 1984; Saher and Schmiegelow, in prep.), but there has been relatively little work done on the Narraway/Belcourt caribou that winter in British Columbia. Caribou in west-central Alberta tend to winter in lower elevation forests, as opposed to the higher elevation alpine areas. However, aerial surveys and inventories, as well as several biologists and managers familiar with the Narraway/Belcourt area, have reported caribou wintering in the alpine areas of Mt. Secus, Ptarmigan Mtn. and Belcourt Mt. (Stevenson and Hatler, 1985; Province of BC, 1990; Murray, 1992; Pate, pers. comm.; Woods, pers.comm.). Brown and Hobson (1998) suggested that the decision to remain in windswept alpine, or to migrate to low elevation forests, was related to yearly snow accumulations. Winter habitat use in these areas is restricted to high elevation, windswept alpine ridges and subalpine krummholz areas, with little to no mature tree cover (Woods, pers. comm.). Gray and Bloomfield (1980) suggest that some caribou in the A La Peche area of west-central Alberta also used subalpine meadows and krummholz habitats during the winter months.

Caribou populations outside the Dawson Creek TSA/TFL 48 have shown similar habitat use patterns during early and late winter (Wood, 1996; Poole et al., 2000). Caribou in the Takla Lake region strongly selected for alpine vegetation cover classes, and avoided forested areas (Poole et al., 2000). Mean elevation of winter locations were 1357 m and 1568 m in early and late winter, respectively, and caribou used slopes less than 30%, showing preferences for western aspects (Poole et al., 2000). Forage analysis showed Omineca caribou to use the treeless alpine (subalpine parkland or krummholz habitats) during the winter, as well as occasional use of upper

ESSF forests (Wood, 1996). Winter habitat use of the Graham herd showed high use of alpine and subalpine habitats, as well as ESSF forests during early winter months (Backmeyer, 2000).

3.3.1.2 Low Elevation Winter Range

Caribou in the Quintette and Narraway/Belcourt areas make use low elevation winter ranges (Seip, 1998; Backmeyer, pers. comm.; Pate, pers. comm.; Woods, pers. comm.). Low elevation winter range within the Dawson Creek TSA/TFL 48 is characterized by boreal coniferous forests that provide abundant terrestrial lichens, ground forage and favourable snow conditions (Murray, 1992). The low elevation areas on the Kiskatinaw Plateau used by wintering caribou are primarily lodgepole pine flats, mixed conifer forests or black spruce swamp habitats (Murray, 1992; Brown and Hobson, 1998). Pate (pers. comm.) supports this by describing the low elevation winter ranges as poor sites characterized by wet or shallow soils over bedrock. They are dominated by a combination of black spruce and short, open pine stands. These stands have abundant terrestrial lichens, as well as low snow accumulations. Caribou wintering in these areas used habitats between 600 and 1200 m in elevation (Sopuck, 1985; Murray, 1992).

The low elevation winter ranges are much larger in area than high elevation ranges and caribou have been reported to move up to 25 km between feeding locations while on the low elevation winter range (Sopuck, 1985). The low elevation forests are favourable for extensive movements as snow conditions and depths are not restrictive to traveling or to cratering for ground forage (Sopuck, 1985).

In west-central Alberta, similar low elevation winter habitats exist and caribou use within these habitats has been documented. Caribou in the Berland-A La Peche and Prairie Creek areas wintered in low elevation habitats, dominated by mature forests types including lodgepole pine, lodgepole pine/white spruce and black spruce communities (Gray and Bloomfield, 1980; Bloomfield et al., 1981; Benn and Bloomfield, 1981). Edmonds and Bloomfield (1984) described caribou to use lodgepole pine and pine/spruce forests, with flat to gentle slopes. Old-growth forests a minimum 120 years of age, however, were selected by wintering caribou in west-central Alberta when snow accumulations became limiting. These old growth stands were also abundant in arboreal lichens. Bjorge (1984) also studied caribou in west-central Alberta, and reported that caribou avoided stands less than 82 years old, and selected for forests between 121 and 141 years of age. Older forest classes were used more during late winter, when snow depths were greater, as they provided greater snow interception (Bjorge, 1984).

Numerous reports have suggested that caribou wintering in low elevation forests also make use of natural clearings and meadows (Gray and Bloomfield, 1980; Benn and Bloomfield, 1981; Bjorge, 1984; Brown and Hobson, 1998). Bjorge (1984) found caribou used coniferous forests that were within 250 m of meadows, and that use of meadows was significantly greater in years of lower snow accumulations. Meadows, natural clearings and sedge/shrub meadows are also used as secondary feeding sites. Feeding activities in meadows is assumed to be related to snow depth and condition and may act as a supplemental forage source for wintering caribou (Benn and Bloomfield, 1981; Edmonds and Bloomfield, 1984; Brown and Hobson, 1998)

3.3.2 Winter Forage

For caribou, winter is the most critical season for obtaining forage, and thus forage availability largely determines physiological stress and individual survival (Skoog, 1968). In addition, feeding habits of northern caribou are largely dependent on the winter range being used. In high elevation alpine areas, caribou primarily forage on terrestrial lichens, as well as sedges and grasses found in low snow packed subalpine meadows (Wood, 1996; Seip, 2002; Jones et al., 2004). Windswept alpine areas are important sources of terrestrial lichens for caribou, and are extensively used for foraging by caribou in the Dawson Creek TSA/TFL 48 (Jones et al., 2004). These areas not only have abundant terrestrial lichens, but also have favorable snow conditions and depths for cratering (Jones et al., 2004).

In low elevation forests, terrestrial lichens are also the most commonly utilized forage item for wintering caribou (Wood, 1996; Cichowski et al., 2004). Caribou will crater in low snow depths to forage on terrestrial lichens. The low elevation coniferous forests, primarily occurring on the Kiskatinaw Plateau, provide abundant terrestrial lichens. Terrestrial lichens are usually found on dry sites, sites with low productivity or in older forests, ranging from 80 to 250 years (Edmonds and Bloomfield, 1984; Seip, 1998; Cichowski et al., 2004). However, Gray and Bloomfield (1980) found terrestrial lichens were most prolific in stands between 51 and 75 years of age. Pate (pers. comm.) discussed that terrestrial lichens are also abundant in black spruce forests on organic soils. In the A La Peche area of west-central Alberta, stands with stocking rates from 500 to 1000 and 1001 to 1500 stems/ha had the greatest lichen biomass. In addition, stand heights of 10.1 to 15.0 m were the most conducive to terrestrial lichen production (Gray and Bloomfield, 1980).

In west-central Alberta, the majority of cratering activity occurred in lodgepole pine and meadow communities, but was also observed in mixed coniferous, white spruce and lodgepole pine-white spruce forests (Bloomfield et al., 1981). Lodgepole pine and lodgepole pine-white spruce forests provided the highest terrestrial lichen biomass (average of 985 kg/ha and 688 kg/ha, respectively), and meadows produced the lowest, with an average 10 kg/ha (Gray and Bloomfield, 1980). Meadows provided a large grass and sedge component, however, which likely supplements a lichen-based diet (Bloomfield et al., 1981). Conversely, Edmonds and Bloomfield (1984) suggested that a regenerating pine forest (less than 75 years of age) had the greatest terrestrial lichen biomass, and man-made clearings had the lowest biomass. In addition, caribou avoided large clearcut areas throughout the winter (Edmonds and Bloomfield, 1984). Szkorupa (2002) found that habitats with abundant cratering activity had a greater amount of pine than control sites, and cratering activities were associated with stands that had 50% canopy closure (Szkorupa, 2002).

Feeding on arboreal lichen is presumed to occur opportunistically when available (Cichowski et al., 2004). For example, caribou have been observed feeding on arboreal lichens in blow-down areas, which created accessible, abundant arboreal lichens (Benn and Bloomfield, 1981). Arboreal lichens, primarily *Bryoria*, are also an important component of winter diet when snow accumulations and snow conditions make it unfavourable to crater for terrestrial lichens and other ground forage (Benn and Bloomfield, 1981; Johnson et al., 2000; Cichowski et al., 2004). Szkorupa (2002) found that increased snow depths did not influence the amount of cratering, but

did increase the amount of feeding on arboreal lichens. The abundance of arboreal lichens is significantly related to the amount of spruce and to the age of the forest (Szkorupa, 2002). Arboreal lichens were more abundant in stands that were significantly older, had a greater percentage of spruce, and had lower terrestrial lichen production (Edmonds and Bloomfield, 1984; Szkorupa, 2002).

The switch from terrestrial feeding to arboreal feeding appears to be linked to snow depth and snow condition (Skoog, 1968; Bloomfield et al., 1981; Szkorupa, 2002; Jones et al., 2004). As snow hardness and snow depths become extreme, caribou tend to switch feeding habits from cratering to arboreal feeding, thus changing habitat use as well (Bloomfield et al., 1981; Jones et al., 2004). The impact of snow conditions on feeding behaviour and the critical levels of snow density, depth and hardness will be discussed in the following section (Section 3.3.3).

Forage preference among northern caribou is fairly consistent across the three herds within the Dawson Creek TSA/TFL 48, with the primary forage item being terrestrial lichens (Table 3; Harper, 1988). Northern caribou utilize a variety of forage items, ranging from terrestrial and arboreal lichens to sedges, grasses, moss, and dwarf shrubs (Jones et al., 2004). Forage use has been primarily analyzed in west-central Alberta caribou populations, with current forage analysis being conducted by Jones et al. (2004).

Table 3. List of documented forage species utilized by northern ecotype caribou. Species most commonly consumed are in bold.

Terrestrial Lichens	Arboreal Lichens	Shrubs	Other
***Cladonia* spp.**	*Bryoria* spp.	*Vaccinium vitis-idaea*	Bryophytes
***Cladina* spp.**	*Usnea* spp.	*Ledum groenlandicum*	Mosses
Peltigera spp.			Sedges
***Stereocaulon* spp.**			Graminoids
***Cetraria* spp.**			*Empetrum nigrum*
Cladina mitis			*Empetrum* spp.
Peltigera aphthosa			*Carex* spp.
Peltigera malacea			
Cladonia rangiferina			
Cladonia gracilis			
Cladonia unicialis			
Cetraria cuculatta			
Cetraria islandica			
Cetraria ericetorum			
Cetraria nivalis			

Based on direct observations and crater investigations, Benn and Bloomfield (1981) found *Cladonia* spp., *Vaccinium vitis-idaea* and *Cladina mitis* were the most frequent species encountered in caribou feeding sites in west-central Alberta. Other species that were common in craters included *Peltigera aphthosa*, *Stereocaulon* spp., *Ledum groenlandicum* and a variety of Bryophytes that are usually consumed because of their association with lichens. Although

Ledum groenlandicum and *Vaccinium vitis-idaea* were common in feeding craters, it is believed that they are not the species being selected for, but are common because of their association with species such as *Cladina mitis*, *Cladina rangiferina*, and *Peltigera aphthosa* (Benn and Bloomfield, 1981). Pellet analysis conducted by Edmonds and Bloomfield (1984) showed terrestrial lichens to be the primary forage species used (Edmonds and Bloomfield, 1984). Terrestrial lichens that were common included species of *Cladina*, *Cladonia*, *Cetraria*, *Stereocaulon* and *Peltigera* (Edmonds and Bloomfield, 1984). Lodgepole pine was the most abundant coniferous tree used for forage. As snow depths increased, terrestrial lichen fragments decreased and shrub fragments became more abundant in pellets (Edmonds and Bloomfield, 1984). Skoog (1968) discussed that browse species do not generally comprise a large portion of the winter diet for caribou, and suggests that if excessive browse is being eaten it may be considered a sign of starvation in caribou.

Pine-lichen stands are of critical forage importance to the Narraway/Belcourt and Quintette herds. These vegetation communities are important with regards to management because of the high timber values associated with lodgepole pine stands and the high abundance of caribou forage species produced. Seip (pers. comm.) describes that pine-lichen stands become less productive with age, and that lichen production is greatest when pine-lichen stands are at a younger age. Sulyma and Coxson (2001) found that the *Cladina* spp. of lichen is most prolific in lodgepole pine stands between 80 to 100 years of age. After 150 years, the moss forming stage becomes dominant and remains until a stand-replacing fire resets the system (Sulyma and Coxson, 2001). If a stand is allowed to mature, and is not impacted by natural fire disturbance or forestry activities, the pine stand will become dominated by mosses, which reduce lichen availability and are of poor forage quality for caribou (Seip, pers. comm.). However, it is important to recognize that large disturbance to pine stands are not always beneficial to the lichen community. Newly disturbed stands may take 80 years until lichen production is maximized (Edmonds and Bloomfield, 1984). Terrestrial lichens are most productive in the period between when stands are establishing and prior to excessive canopy closure, which increases the amount of mosses and decreases terrestrial lichen abundance. Pine stands used as caribou winter range need to be managed to maximize terrestrial lichen production (Seip, pers. comm.).

3.3.3 Snow Depth

Caribou, as a species, are well adapted to snow conditions (Nasimovich, 1960). However, Edwards (1956) suggested that population declines of many ungulate species, including caribou, may be related to snow depths. Northern ecotype caribou, compared to mountain ecotype, typically inhabit regions and habitats that have lower snow accumulations. Snow depth and snow condition are nonetheless critical factors in determining forage selection, and therefore habitat selection (Szkorupa, 2002). Snow conditions ultimately affect the forage availability, ability to detect forage, and the ability to obtain forage. Shallow, soft snow is favourable for cratering for terrestrial lichens, and deep or hard snowpack is more favourable for accessing on arboreal lichens (Bloomfield et al., 1981; Szkorupa, 2002). A caribou's ability to detect forage is dependent on snow depth and density, as increased snow density limits an individual from being able to smell lichens beneath the snow (Nasimovich, 1960; Skoog, 1968; Edmonds and Bloomfield, 1984). In response to increasing snow depths and hardened snow packs, caribou

will often alter their foraging behaviour, by foraging on arboreal lichens rather than cratering for terrestrial lichens. Szkorupa (2002), however, found that the amount of cratering did not decrease with increased snow conditions, but the amount of arboreal feeding did increase.

Snow depths also contribute to movement patterns and habitat selection of caribou. Cichowski et al. (2004) suggest that movement from summer to winter range, as well as the use of varying winter ranges, are dependent on snow depths. Snow depths can also affect movement within winter ranges, especially on the widespread low elevation ranges. Bloomfield et al. (1981) reported caribou to limit their movements within range after a large snowfall. Edmonds and Bloomfield (1984) found caribou would not travel through snow packs greater than 75 cm, and would select old trails or packed roads instead.

There are many examples of caribou altering or changing habitat use in response to snow accumulations. Backmeyer (1991) discussed caribou in the Carbon Creek area moved out of the alpine, in response to increased snow depths, and selected adjacent subalpine forests. During certain times throughout the winter, forested habitats may have more favourable snow conditions than other areas, such as high elevation alpine. Low elevation pine forests usually have soft, shallow snow accumulations that allow for easy cratering (Pate, pers. comm.). Caribou in the Graham herd were forced into high elevation alpine areas during high snowfall years, and under lower snow conditions, caribou were able to utilize lower elevation forests (Backmeyer, 2000). Jones et al. (2004) reported that Kennedy-Siding caribou responded to snow depths of 22 cm and high sinking depths, by making movements from low elevation pine flats to subalpine and alpine habitats. Nasimovich (1960) reported caribou to move from forested habitats to snow packed alpine when snow depths reached 40 to 60 cm. Habitat use in west-central Alberta is likely determined by snow accumulations (Edmonds and Bloomfield, 1984). In low snow years, caribou made use of meadows and man-made clearings, which are not used in higher snow years for foraging. Conversely, in high snowfall years, caribou increased their use of windswept alpine ridges for foraging. Edmonds and Bloomfield (1984) also found caribou to move into old-age timber in response to heavy snowfalls. Snow depth, however, may not always impact habitat use. In the Selkirk Mountains of BC, caribou did not select for habitats with significantly different snow depths (Rominger and Oldemeyer, 1989).

Critical snow conditions affecting foraging and travel behaviour of caribou have been defined in Canada, as well as in Russia (Table 4; Edwards, 1956; Pruitt, 1959; Nasimovich, 1960). Critical snow levels, however, are variable and are highly dependent on specific geographic regions, weather patterns and habitat types (Edmonds and Bloomfield, 1984). Nasimovich (1960) suggested movement might be impeded in soft snow greater than 60 cm, and that caribou will not live in areas with snow depths greater than 80 cm because they are not able to escape from predators. Szkorupa (2002) found caribou to alter their foraging behaviour in response to snow depths of 60 to 70 cm in west-central Alberta. Whereas other studies in west-central Alberta have suggested that caribou will crater in snow depths of 100 cm, with no critical snow depth being recognized (Edmonds and Bloomfield, 1984). More specifically, caribou in west-central Alberta moved away from meadow habitats when snow levels reached 60 cm, but would crater in forested habitats with snow depths of 79 cm and greater (Edmonds and Bloomfield, 1984). The impact of snow depths and the range of critical snow depths will vary depending on the amount of wind and freeze-thaw conditions that occur throughout the winter (Pruitt, 1959;

Skoog, 1968). Freeze-thaw conditions may impede caribou from cratering or breaking the snow surface (Skoog, 1968), but the crusting of layers also allows for easier travel between mountain and forested habitats (Nasimovich, 1960).

Table 4. Critical snow conditions reported for caribou populations in various geographic regions.

Area	Snow Depths	Snow Hardness	Snow Density	Reference
Saskatchewan	50-60 cm	6.5-60 g/cm^2	0.13-0.20	Pruitt, 1959
Russia	50-60 cm	-	0.24-0.26	Nasimovich, 1960
West-central	68 cm	-	-	Gray and Bloomfield, 1980
Alberta	75 cm*	1000 g/cm^2	-	Edmonds and Bloomfield, 1984
Omineca	37-97 cm	28.89 g/cm^2	-	Johnson et al., 2000

*Snow depths of 75 cm was the critical depth for traveling (Edmonds and Bloomfield, 1984)

Within the Dawson Creek TSA/TFL 48, snow depths are significantly shallower in alpine areas than in subalpine forest or in valley-bottom habitats (Jones et al., 2004). Snow depths decrease across the region, from the continental divide to the east. During the winter, most caribou populations move easterly, away from high snow accumulation areas (Seip, pers. comm.). In the summer, caribou make westerly movements, back into the mountains (Seip, pers. comm.).

3.3.4 Security and Thermal Cover

Security and thermal cover are not the primary limiting factors in winter survival of caribou.

3.4 Access Management and Human Disturbance

Within the Dawson Creek TSA/TFL 48, extensive industrial development and human activity has increased the need for restrictive access management when considering caribou populations and critical winter ranges. With increased access due to road construction, seismic lines and other linear corridors, caribou populations are being threatened from the potential of increased predation, habitat fragmentation, and increased human disturbance (Seip, 1998). The impacts of access and human disturbance have been extensively documented for caribou populations across Canada (Bergerud et al., 1984; Murray, 1992; Seip and Cichowski, 1994; Dzus, 2001). Woodland caribou rely on being spatially segregated from predators, and other ungulate species that may increase the number of predators. Increased access, via roads or linear corridors, to critical winter range areas allows predators to easily travel along these corridors to reach previously segregated caribou ranges (Seip and Cichowski, 1994). This increases the likelihood of encounter rates between predators and caribou, and increases caribou density, forcing caribou to become more concentrated (Dzus, 2001). Bergerud et al. (1984) suggested that increased seismic lines and access to previously remote areas resulted in dramatic declines in the numbers of caribou in the Pink Mountain area of northeastern BC. Mining and logging roads contributed to increased access in the Atlin caribou herd, and impacted mountain caribou in the Prince George area (Bergerud et al., 1984). Extensive road development will also increase illegal hunting, road collisions with caribou, recreational activities and human disturbance (Murray, 1992; Seip and Cichowski, 1994).

3.5 Range and Agricultural Conflicts

The UWR areas identified within this proposal do not have range/agricultural conflicts.

3.6 Other Management Concerns

As discussed above, caribou require a number of key elements in their winter range. Abundant forage, in the form of terrestrial lichens, appears to the most critical aspect of winter range. It is also the most impacted by forest development, especially in the low elevation winter ranges. Seip (pers. comm.) suggests that pine-lichen stands need to be managed as to ensure the highest production of lichens. Therefore, a management regime that rotates around an interval of 50-100 years, to continuously provide caribou habitat by maintaining younger pine stands, is critical. Coxson and Marsh (2001) suggest that natural thinning of stands older than 50 years creates enhanced growing conditions for *Cladonia* spp. lichens. Timber harvesting activities conducted during the winter months produced little harmful affects to the lichen community (Coxson and Marsh, 2001). If lichens are not disturbed during the harvesting process, the increased light penetration from a reduced canopy will enhance the already established lichen community (Coxson and Marsh, 2001). Strictly protecting pine-lichen stands would benefit caribou for the short term, but in the long term, the forest would become too mature and lose its lichen productivity (Seip, pers. comm.).

Brown et al. (2000) studied the relationships between lichen abundance and stand attributes in the Redwillow area of northeastern British Columbia. Lichen cover was highest in stands with tree heights less than 15 m, with crown closures less than 40%, and with stands less than 100 years of age (Brown et al., 2000). Overall, lichens were most abundant in pine and pine-dominated stands that were 7-to17 m in height, which are below the harvest range of Canadian Forest Products (Brown et al., 2000).

For high elevation winter ranges, abundant forage must be available, but it is also critical that animals on the high elevation ranges are spatially segregated from predators. For this reason, I suggest that all high elevation ranges should remain intact, free of roads and other linear corridors. I have proposed that high elevation alpine areas include a buffer of undisturbed subalpine forests. It is the intent that this buffer will help keep the alpine areas spatially segregated and less conducive to early seral species such as moose or elk.

4. UWR OBJECTIVES FOR MANAGEMENT OF WOODLAND CARIBOU IN THE PEACE REGION – DAWSON CREEK FOREST DISTRICT

4.1 High Priority UWR

4.1.1 Low Elevation Winter Ranges

1. Minimize disturbance to lichen communities (Arthur, 2002; Coxson and Marsh, 2001).
    a. Harvest during winter months when the lichen community experiences the smallest disturbance (Coxson and Marsh, 2001).
    b. Set harvest areas to allow caribou to retreat to adjacent suitable winter range without disturbance during the winter season.
2. Maintain pine-lichen forests to maximize lichen production (Coxson and Marsh, 2001; Seip, pers. comm.)
    a. Mimic natural disturbance regime in forest harvesting practices
        i. Mimic natural disturbance by maintaining large, even-aged stands of pine (Seip, 1998)
        ii. Old-growth forests should be periodically disturbed to limit colonization of vascular plants and mosses (Seip, 1998)
    b. Pine-lichen stands should be harvested at rotations to maintain large stands aged 80-120 years.
    c. To maximize lichen production create a managed stand with:
        i. Forty percent canopy coverage for lichen production (Brown et al., 2000)
        ii. Minimum stand height of 3.6 m (Edmonds and Bloomfield, 1984)
    d. Selective harvest – allows for lichen biomass to return faster compared to clearcut (Bjorge, 1984; Westworth Environmental Associates, 1998; Smith et al., 2000)
    e. Avoid clearcuts – lichen regeneration is much slower in clearcuts (Edmonds and Bloomfield, 1984)
3. Minimize impact of predators and human disturbance
    a. Maintain stands that are large, contiguous
        i. Large cut areas, with equal sized leave areas
        ii. Cut areas should be greater than 600 ha, with leave areas also 600 ha (Seip, 1998; Westworth Associates Environmental, 1998)
        iii. Utilize existing access and restrict creation of new roads through large leave areas
    b. Silviculture prescriptions should mimic natural disturbance (Westworth Associates Environmental, 1998; Seip, 1998)
        i. Reduce shrub and early seral browse in cut areas
        ii. Avoid excessive slash
        iii. Maintain a minimum of 10% old-growth in clearcut areas (Seip, 1998)
    c. Minimize edge habitats and early seral habitats to decrease invasion of early seral ungulates and thus predators

4.1.2 High Elevation Winter Ranges

1. Minimize impact of predators and human disturbance – keep alpine areas isolated/protected from disturbance
    a. Keep high elevation alpine areas isolated from ungulates that are early seral specialists
        i. No harvest zones around core areas (Smith et al., 2000)
        ii. No access into alpine
    b. Reduce aerial activity/disturbance above alpine areas during winter season
2. Protect lichen communities and windswept alpine
    a. No disturbance in the alpine
    b. No access into alpine – roads, seismic, etc.

4.2 Medium Priority UWR

Some areas have been designated as medium priority because the current use of these areas by wintering caribou is unknown, and thus the importance of these areas for UWR is uncertain. Caribou, however, have historically used these areas during the winter, and thus management objectives for the areas would be consistent with those outlined for high priority UWRs.

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APPENDIX 1

INDIVIDUAL POLYGON DESCRIPTIONS

APPENDIX 1. Individual Woodland Caribou UWR Polygon Descriptions – Dawson Creek Timber Supply Area.

Polygon 1

Herd: Moberly
Name: Mt. McAllister
Rank: High Priority UWR
Polygon Description: all areas above 1300 m elevations are included in the UWR polygon
Habitat Use: Caribou make use of the high elevation windswept alpine, as well as the ESSFwk2 and ESSFmv3 forests during early and late winter. These forests provide key forage for caribou including terrestrial lichens in the alpine.
Support: The area identified has shown extensive use by caribou in the past and present at elevations approximately 1300 m and greater

- Backmeyer, 1991;
- TERA, 1995a;
- TERA, 1995b;
- Wood and Hengeveld, 1998;
- Jones et al., 2004

Management Objectives within the polygon: No harvesting area – harvesting would increase predator access to the windswept alpine, fragmentation would concentrate caribou and increase predator search efficiency, and lichen supply in the ESSF forests would be lost.
Notes: It is important to note that many individuals within the Moberly herd may remain in the ESSF forests during the majority of the year, excluding spring and early summer.

Polygon 2

Herd: Moberly
Name: Beattie Peaks/Mt. Monteith/Mt. Frank Roy
Rank: High Priority UWR
Polygon Description: All areas above 1300 m are included in the UWR polygon
Habitat Use: Primarily in the alpine and subalpine parkland at elevations above 1500 m. Caribou primarily use the windswept alpine during early and winter, foraging on terrestrial lichens and other vegetation.
Support:

- TERA, 1995a;
- TERA, 1995b
- Jones et al., 2004;
- Seip, pers. comm.

Management Objectives within the polygon: No harvest zone – see polygon 1
Notes: During late winter, caribou use the ESSF forests north of Beattie Peaks towards McAllister Creek, and thus the polygon includes all areas above 1300 m rather than 1500 m. Also, there is evidence of movement between Mt. McAllister and Beattie Peaks/Mt. Frank Roy through these ESSF forests and across McAllister Creek valley.

Polygon 3

Herd: Moberly
Name: Mt. Bickford/Boulder Ridge
Rank: High Priority UWR
Polygon Description: two polygons 3a and 3b, which include areas above 1500 m on Boulder Ridge and Mt. Bickford
Habitat Use: Caribou in this "herd" utilize the alpine areas for the majority of the year, and especially during the winter. Subalpine parkland is also used above 1500 m.
Support:
Management Objectives within the polygon: No harvest – because the caribou in this herd are limited to these two alpine areas (little to no current movement across the highway), increase amount of disturbance to alpine by snowmobiles and presence of wolves in the alpine. Required to protect the alpine areas, by limiting and restricting harvesting surrounding the alpine areas.
Notes: A corridor UWR between Mt. Bickford and Boulder Ridge would be effective in facilitating movement between the two high elevation wintering areas.

Polygon 4

Herd: Moberly
Name: Mt. Le Hudette
Rank: High Priority UWR
Polygon Description: alpine and subalpine areas surrounding and including Mt. Le Hudette and north above 1500 m
Habitat Use: Caribou primarily use high elevation alpine and subalpine parkland habitats. There is historical evidence of high elevation winter range by Stevenson and Hatler (1985) that suggest there is some use of ESSF forests at approximately 1300-1400 m.
Support:

- Stevenson and Hatler, 1985;
- Seip, 2002;
- Jones et al., 2004;
- Woods, pers. comm.

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1500 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.

Polygon 5

Herd: Unknown (Burnt River?)
Name: Howling Wolves-Gilland-Goodrich
Rank: Medium Priority UWR
Polygon Description: Two polygons, 5a and 5b, including alpine areas above 1500 m.
Habitat Use: Stevenson and Hatler (1985) originally designated the two polygons as one high elevation winter range; however, recent research does not suggest that these areas are heavily used by caribou to support the polygon including areas above 1300 m. Jones et al. (2004) reported one caribou using Howling Wolves Peak during early winter, with several locations in the alpine tundra zone. Woods (pers. comm.) discussed that not enough inventory has been done in the upper Burnt River area to determine the importance and continued use of this area by caribou. A medium priority has been assigned to this area because of a lack of consistent caribou use reported.
Support:

- Stevenson and Hatler, 1985;
- Westworth Associates Environmental, 1998;
- Jones et al., 2004

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1500 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.
Notes: Management objectives may be adjusted based on lack of continuous use by caribou. If caribou are using the area, it is important to protect the alpine and subalpine areas that provide isolation from predators and windswept alpine.

Polygon 6

Herd: Moberly
Name: Mt. Stephenson
Rank: High Priority UWR
Polygon Description: one area around the alpine and subalpine parkland areas around Mt. Stephenson – areas above 1500 m
Habitat Use: Caribou are using primarily high elevation windswept alpine and subalpine parkland habitats. The area has been identified as consistently used by wintering caribou.
Support:

- Stevenson and Hatler, 1985;
- TERA, 1995a;
- TERA, 1995b;
- Woods, pers. comm.

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1500 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.

Polygon 7

Herd: Quintette
Name: Wolverine-Murray
Rank: High Priority UWR
Polygon Description:
Habitat Use: High elevations areas at the height of land between the Murray and Wolverine Rivers have shown extensive use by caribou in the past and present. The polygon has included all areas from 1300 m and up. Given the amount of development and activity it is critical to maintain these alpine/subalpine areas, and ensure the area can continue to support caribou in the area. The polygon includes all areas above 1300 m to ensure continuity throughout the winter range area.
Support:
Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1300 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.

Polygon 8

Herd: Narraway/Belcourt
Name: Ptarmigan-Secus
Rank: High Priority UWR
Polygon Description: Alpine and subalpine areas on Ptarmigan Mtn. from 1500 m and up.
Habitat Use:
Support:

- Stevenson and Hatler, 1985;
- Province of BC, 1990;
- Murrary, 1992;
- Pate, pers. comm.;
- Woods, pers. comm.

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1500 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.

Polygon 9

Herd: Narraway/Belcourt
Name: Compass-Chinook
Rank: High Priority UWR
Polygon Description: The polygon encompasses lower elevation plateau areas between Red Deer Creek and Belcourt Creek, as well as low elevation plateau areas between Chinook Ridge and Compass Hill. The northern boundary of the polygon is the Wapiti River, and the polygon extends to the Alberta border in the east.
Habitat Use: Caribou remain spatially segregated while using the low elevation pine stands occurring in this area.
Support: Brown and Hobson (1998) discussed this area to be used as winter range by caribou in the Calahoo herd. Ministry of Environment aerial inventories also suggest this area is critical to wintering caribou. Recent research conducted out of the University of Alberta suggests this area is the primary winter range for Narraway caribou summering in the upper Narraway Mountains (Saher and Schmiegelow, in prep).

- Province of BC, 1990;
- Murray, 1992;
- Brown and Hobson, 1998;
- Saher and Schmiegelow, in prep;
- Backmeyer, pers. comm.;
- Woods, pers. comm.

Management Objectives within the polygon: Forest harvesting regimes should follow that described in Section 4.1.1.

- Maintain pine-lichen forests,
- Minimize disturbance to lichen communities
- Minimize impact of predators and human disturbance
- Minimize road access through the core of the area.

Polygon 10

Herd: Narraway/Belcourt
Name: Mt. Hamelin complex
Rank: Medium Priority UWR
Polygon Description: The UWR polygon includes alpine and subalpine areas above 1500 m.
Habitat Use: Stevenson and Hatler (1985) suggested areas above 1500 m to be important caribou winter range habitat. Brown and Hobson (1998) reported caribou from the Calahoo herd could winter in this range as well. Although most alpine is at or above 1700 m, a 200 m elevational buffer has been added to the polygon to provide caribou with undisturbed alpine/subalpine habitats.
Support:

- Stevenson and Hatler, 1985;
- Brown and Hobson, 1998.

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1500 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.
Notes: This has been classified as a medium priority because current and continuous use of this area by wintering caribou has not been extensively documented. The area, however, does have good high elevation winter range potential.

Polygon 11

Herd: Quintette
Name: Quintette-Babcock
Rank: High Priority UWR
Polygon Description: The UWR polygon includes alpine and subalpine areas above 1400 m.
Habitat Use: Caribou winter use occurs primarily in the alpine areas of Babcock and Quintette Mtns. above 1500 m in elevation. However, to maintain continuity between the two alpine areas, the polygon includes all areas above 1500 m.
Support:

- Province of BC, 1977;
- Sopuck, 1985;
- Stevenson and Hatler, 1985;
- Province of BC, 1990;
- Murray, 1992;
- Jones et al., 2004.

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1400 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.

Polygon 12

Herd: Quintette
Name: Spieker-Collier
Rank: High Priority UWR
Polygon Description: The UWR polygon includes alpine and subalpine areas above 1400 m.
Habitat Use: In addition to high use of the alpine and subalpine, Jones et al. (2004) reported evidence of early winter use in forested ESSF habitats.
Support:

- Province of BC, 1977;
- Murray, 1992;
- Jones et al., 2004;
- Seip, pers. comm.

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1400 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.

Polygon 13

Herd: Quintette
Name: Chamberlain-Bullmoose
Rank: High Priority UWR
Polygon Description: The UWR polygon includes alpine and subalpine areas above 1400 m.
Habitat Use: Caribou use high elevation alpine and subalpine habitats on Chamberlain and Bullmoose Mtns. It is important that these areas were grouped to ensure movement between the isolated alpine ranges.
Support:

- Province of BC, 1977;
- Stevenson and Hatler, 1985;
- Murray, 1992.

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1400 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.

Polygon 14

Herd: Quintette
Name: Bullmoose Flats
Rank: High Priority UWR
Polygon Description: The polygon is located in the low elevation areas in the Boreal White and Black Spruce (BWBS) biogeoclimatic zone. The polygon is bordered in the north by Mikle Creek. In the west and south, the polygon borders along the edge between the BWBS and the ESSF biogeoclimatic zones. In the east, the polygon joins with the Low Elevation Zone (Polygon 15).
Habitat Use: Caribou are consistently observed wintering in the low elevation pine stands along Bullmoose Creek. These pine stands provide abundant lichens and lower snow accumulations during the winter.
Support:

- Province of BC, 1977;
- Stevenson and Hatler, 1985;
- Province of BC, 1990;
- Murray, 1992;
- Pate, pers. comm.;
- Woods, pers. comm.

Management Objectives within the polygon: Forest harvesting regimes should follow that described in Section 4.1.1.

- Maintain pine-lichen forests,
- Minimize disturbance to lichen communities
- Minimize impact of predators and human disturbance
- Minimize road access through the core of the area.

Polygon 15

Herd: Quintette
Name: Low Elevation Flats
Rank: High Priority UWR
Polygon Description: A very large polygon that encompasses all the low elevation ranges east of Tumbler Ridge. The northern boundary is Salt Creek, down the West Kiskatinaw River, and straight east to the Alberta border. The western boundary is the park in the north, and then follows down Flatbed Creek/Tumbler Ridge Creek and Honeymoon Creek until the BWBS/ESSF border west of Stony Lake. The southern boundary is Stony Lake and along the BWBS/ESSF border to the Alberta border.
Habitat Use: Caribou using these habitats are wide-ranging, using lodgepole pine and black spruce forests. Animals rely on being spatially segregated from predators, as well as from other ungulates. Terrestrial lichens are the primary food source while occupying these winter ranges.
Support:

- Province of BC, 1977;
- Sopuck, 1985;
- Stevenson and Hatler, 1985;
- Province of BC, 1990;
- Murray, 1992;
- Pate, pers. comm.;
- Woods, pers. comm.

Management Objectives within the polygon: Forest harvesting regimes should follow that described in Section 4.1.1.

- Maintain pine-lichen forests,
- Minimize disturbance to lichen communities
- Minimize impact of predators and human disturbance
- Minimize road access through the core of the area.

Polygon 16

Herd: Moberly (?)
Name: Eleven Mile Creek-Monarch Mtn.
Rank: High Priority UWR
Polygon Description: The UWR polygon includes alpine and subalpine areas above 1400 m.
Habitat Use: Caribou have been observed both in the windswept alpine at elevations above 1500 m as well as in the subalpine forest adjacent to the windswept alpine.
Support:

- Backmeyer, 1991;
- TERA, 1995a;
- TERA, 1995b;
- Seip, 2002.

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1400 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.

Polygon 17

Herd: Moberly (?)
Name: Mt. Gething
Rank: High Priority UWR
Polygon Description: The UWR polygon includes alpine and subalpine areas above 1400 m.
Habitat Use: Caribou have been observed in the windswept alpine at elevations above 1500 m.
Support:

- Backmeyer, 1991.

Management Objectives within the polygon: No harvest and no access within the designated zone. Areas above 1400 m have been protected to ensure alpine areas are isolated from predation and human disturbance, and to protect lichen communities and windswept alpine.