

**Northern Caribou Ungulate Winter Range
in the Vanderhoof Forest District
(U-7-012)**

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Executive Summary

The Ministry of Environment (MOE) has selected areas for Northern Caribou (*Rangifer tarandus caribou*) for the portion of the Tweedsmuir Entiako Caribou herd's range that overlaps with the Vanderhoof Forest District to establish as Ungulate Winter Ranges (UWR) under the Forest and Range Practices Act. Under the authority of the Government Action Regulation of the Forest and Range Practices Act, General Wildlife Measures (GWM) may be established for an UWR. GWMs are essentially forestry practices that a forest licensee operating in the UWR area must follow. In determining what GWMs apply to a given UWR, biologists have considered key life requisites of the Tweedsmuir Entiako Northern Caribou herd's, as well as potential risk factors to Caribou survival. The UWRs and accompanying GWMs in this proposal include 3 High Elevation units (22,629.24 ha) and 3 Low Elevation units (26,067.17 ha), for a total of 48,696.4 ha of UWR. Key information used to define the UWRs was from a variety of sources: Telemetry Data (Marshall, 1985& 2004), Caribou Habitat Mapping (Cichowski and Banner, 1993), delineation of former Vanderhoof Caribou Management Zones (McAllister, 2001), Predictive Ecosystem Maps (PEM)(Vanderhoof IFPA, 2001), Terrestrial Ecosystem Maps (TEM)(Slocan-Plateau Division), Terrain Resources Information Mapping (TRIM), and Forest Cover Maps were all used as source information. The Caribou Habitat Assessment Supply Estimator (CHASE) model (McNay et al., 2003) was used to predict the location of preferred Caribou habitat (high elevation winter range and low elevation/pine-lichen winter range sub-models). Model predictions were validated through an aerial reconnaissance and adjustments made to the UWR boundaries accordingly (Sulyma, and McNay, 2004). The challenge of developing objectives for UWR in the Vanderhoof Forest District is confounded by the current Mountain Pine Beetle epidemic, which affects much of west central interior British Columbia. The objectives presented in this report have been developed to be suitable regarding Caribou habitat management, while considering existing forest health issues. The UWR polygons and GWMs were refined through consultation with experts including Professional Biologists, and Professional Foresters who are familiar with the geographic area, and with the ecology of the Tweedsmuir-Entiako Caribou herd. Also, MOE considered input from other government agencies and stakeholders, including Ministry of Forests, the former Ministry of Sustainable Resource Management, Ministry of Agriculture and Lands, Forest Licensees, and First Nations.

Ungulate Winter Range Initiative

An Ungulate Winter Range (UWR) is defined as an area necessary to meet the winter habitat requirements of a specified ungulate species. Northern Caribou are one category of ungulate species defined by legal order under section 11(3) of the Government Actions Regulation (BC Reg. 17/04) of the Forest and Range Practices Act. Under the authority of sections 9(2) and 12(1) of the Government Actions Regulation (B.C. Reg. 582/2004) of the Forest and Range Practices Act, General Wildlife Measures (GWM) may be established for an UWR. GWMs that accompany the proposed UWRs, have considered key life requisites and potential risk factors to Caribou. GWMs are essentially forestry practice requirements that a forest licensee operating in the UWR area must follow. Developing UWRs entails reviewing existing information on ungulate winter habitat requirements, and providing a clear and defensible rationale for selecting proposed UWR polygons. The overall intent of this UWR proposal is to:

- identify the areas that are necessary for the winter survival of Northern Caribou
- ensure that these areas are distributed in the most effective way for maintaining Northern Caribou across their natural range; and
- ensure that timber supply impacts do not exceed those included in Timber Supply Review (TSR1 and /or TSR 2).

Northern Caribou Species Account

Scientific Name: *Rangifer tarandus caribou*
Species Code: M-RATA
Status: Federally Threatened, Provincially Blue-listed

General Life History

The following description of the general life history and habitat use of Northern Caribou life was extracted from Bergerud (1980, 1992, 1996, 2000), Bergerud *et al.* (1984a), and Seip and Cichowski (1996) in Cichowski, 2002:

The productivity of Caribou is low compared to other cervids in North America because they only have one young per year and calves and most yearlings commonly are not pregnant. The population growth rate rarely exceeds 26% per year. Pregnant females seek secluded sites in alpine and subalpine habitats, and on islands in lakes to calve, presumably as an anti-predator strategy. Calves are born in late May or early June and their mortality during the first few months of life is high, often approaching 50% or greater. Causes of calf mortality may include inclement weather, predation, abandonment, and accidents. Adult females generally live 10-15 years and males 8-12 years in un hunted populations. Annual adult female mortality rates average about 5-15%, but can vary between 0% and 30%. Causes of adult mortality include predation, poaching, accidental deaths (e.g. avalanches), motor vehicle collisions and other unknown causes. Wolf (*Canis lupus*) predation is considered the major limiting factor of Northern Caribou populations throughout most of their range. Most adult mortality occurs during summer and early fall and is primarily predator-related. Tactics used by Caribou to

minimize interactions with predators include seasonal migrations between summer and winter ranges, seasonal migrations to subalpine and alpine areas, and habitat segregation with conspecifics.

Northern Caribou feed mainly on terrestrial and arboreal lichens. Preferred lichen species include *Cladina mitis*, *C. rangiferina*, *C. arbuscula* spp. *beringiana*, *Cladonia uncialis*, *C. ecmocyna*, and *Bryoria* spp. (Anonymous, 2000, Johnson *et al.*, 2000). *Stereocaulon* spp. should also be considered a preferred, or at least secondary preferred species of lichen by caribou (Cichowski, *et al.*, 2001). Arboreal lichens (primarily *Bryoria* spp.) are used to a lesser extent, but may become significant when snow conditions make cratering difficult. Arboreal lichens can occur throughout the forested habitats, but are especially abundant in forested wetlands and spruce fringes surrounding lakes and fens (Cichowski and Banner, 1993). Grasses, forbs, sedges (Cichowski, 1993), horsetails, flowering plants, and leaves of numerous shrubs also contribute to their diet (Cichowski, 2002).

Although there are regional differences in Northern Caribou habitat use (reflecting differences in topography, snow accumulation, and availability of low elevation winter ranges), foraging for terrestrial lichens during winter is a common. In general, Northern Caribou habitat use in B.C. can be described using 4 seasonal time periods:

1) Early-winter (approximately November to mid-January). Caribou move out of high elevation summer ranges to lower elevation early winter ranges. Early winter ranges may be adjacent to the summer range or some distance away. At this time, Caribou continue to seek out terrestrial forage and avoid deeper snow accumulations where terrestrial forage is difficult to access. Fall migration between summer and winter ranges tends to be diffuse as Caribou migrate in response to snow accumulation.

2) Late-winter (approximately mid-January to mid-April). By mid- and late-winter, Caribou have moved to low elevation forested winter ranges, or high elevation alpine/subalpine winter ranges to feed primarily on terrestrial lichens. Arboreal lichen use in subalpine forests increases as snow hardness increases later in winter with melt/freeze conditions. At higher elevations, Caribou prefer windswept alpine slopes for cratering for terrestrial lichens.

3) Spring (approximately mid-April to May). In spring, Caribou that migrate between winter and summer ranges begin moving back to calving and summering areas. Spring migration is more geographically and temporally concentrated than fall migration. During spring, Caribou migrate along relatively snow-free low elevation routes to reach summer ranges. Spring ranges may be adjacent to late-winter ranges, or may be a function of migration patterns. As Caribou move to and through low elevations during spring, they are highly susceptible to predation.

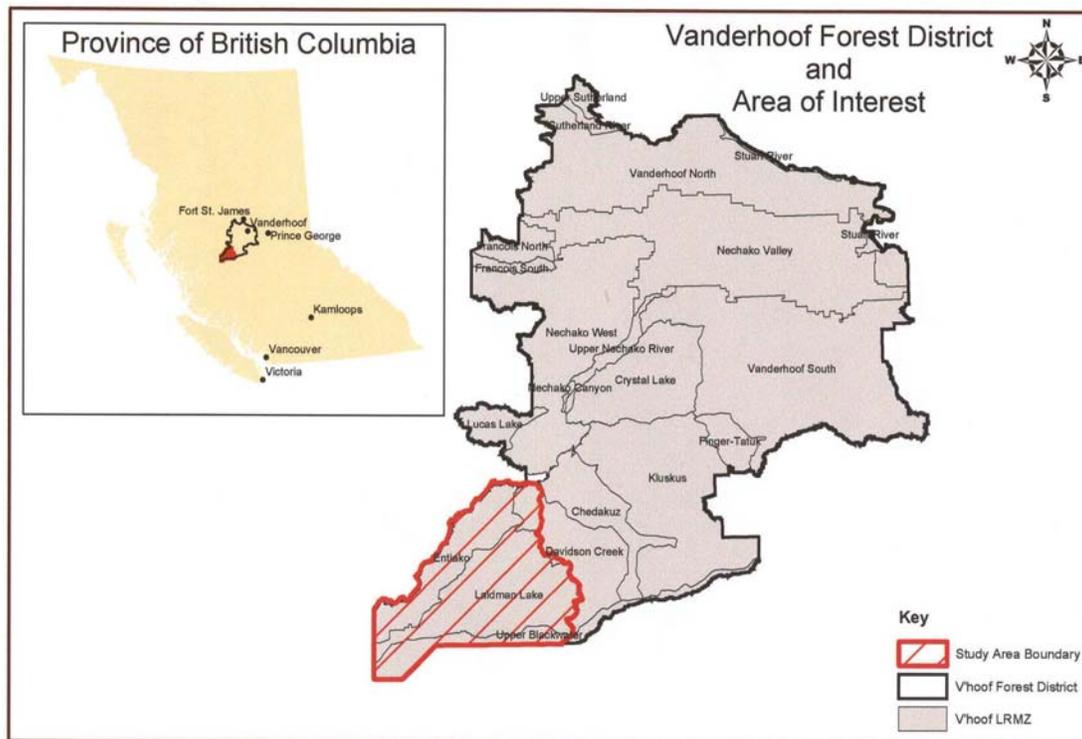
4) Summer (approximately June-October). Female Caribou reach calving areas by late May and calve in early June. Many Caribou calve at higher elevations in alpine or subalpine habitat where food availability and quality is poor, to avoid predators that remain at lower elevations. During summer, Caribou prefer high elevation habitats but can be found in a variety of habitats at all elevations since snow does not limit movement and herb and shrub forage are abundant. Consequently, Northern Caribou are highly dispersed during summer. During October rut, some animals move to rutting areas at higher elevations, while others rut within

their summer ranges. Portions of some local populations concentrate on rutting ranges, usually in open alpine or subalpine habitat.

Tweedsmuir-Entiako Northern Caribou Herd

This UWR proposal is for the portion of the Tweedsmuir-Entiako Northern Caribou herd range that falls within the Vanderhoof Forest District, which is only a small portion of the overall herd range, which extends west and north. The study area we assessed falls within the Laidman Lake RMZ¹ (multi-value emphasis zone) outside of the Entiako Protected Area, as defined in the Vanderhoof LRMP (MOF, 1997) (Figure 1).

Figure 1: General Study Area Assessed for Northern Caribou Ungulate Winter Range in the Vanderhoof Forest District.



The full extent of the Tweedsmuir-Entiako Northern Caribou herd range generally covers from Eutsuk Lake in the west to the Fawnie Mountains in the east. Northern extents of the range are bound by Ootsa Lake, and southern extents are roughly bound by Qualcho Lake (Cichowski, 1993) (Figure 1). General topography for this area is variable with mountainous terrain around the perimeter of the east extent, in the Laidman Lake RMZ. The western portion of the study area is gently rolling to flat. Generally, the area is within the Nazko Upland ecosection of the Central Interior Ecoprovince. The following biogeoclimatic sub-zones are encountered (Meidinger and Pojar, 1991):

¹ A key principle of the Vanderhoof LRMP is to use Resource Management Zones (RMZs) to delineate specific resource values and management objectives. The type of RMZ determines the type of activities (i.e. recreation, timber harvesting, trapping etc.) and level of intensity permitted.

- Sub-Boreal Pine - Spruce zone, moist cold subzone (SBPSmc)
- Sub-Boreal Spruce zone, Babine moist cold and Kluskus moist cold subzones (SBSmc2 and SBSmc3),
- Engelmann Spruce-Subalpine Fir zone, Nechako moist very cold subzone (ESSFmv1)
- Montane Spruce very dry very cold (MSxv)

The climate of all of these zones is continental and is characterized by cold winters (Meidinger and Pojar, 1991). The Engelman Spruce Sub-Alpine Fir (ESSF) zone is higher elevation and receives the greatest amount of snow. The SBPS and SBS have similar seasonal characteristics; however, the SBPS is slightly drier and has cooler mean daily temperatures in the summer. The MSxv is an intermediate biogeoclimatic zone between the ESSF and lower elevations.

The Tweedsmuir-Entiako Northern Caribou herd has a general trend of migration moving to the northwest portion of the range in April-May and to the southeast portion in November. Between December and mid-February Northern Caribou disperse throughout low elevation pine and pine/spruce forests concentrating in the vicinity of the Entiako River. Cichowski (1993) also documented females using areas extending east into the vicinity of Laidman, Moose, and Tsacha Lakes (Laidman Lake RMZ). Depending on snow conditions (and other ecological factors), some Caribou move to higher elevation habitat in the late winter utilizing portions of the Fawnie Mountains. The amount of use is variable, but with the current Mountain Pine Beetle epidemic in the region, it is speculated the importance of the high elevation types may increase over time.

The Southern Mountains National Ecological Area (SMNEA) is a large area that includes the southern two-thirds of British Columbia; it is a grouping used by the Committee on the Status of Endangered Wildlife In Canada (COSEWIC), which is the agency that assesses the national status of species. The Tweedsmuir-Entiako Northern Caribou herd is part of the west-central metapopulation of SMNEA, and in 2002, COSEWIC designated Caribou within this grouping as nationally ²Threatened.

Although there is good information on the extent of this herd's winter range and their behaviour relative to current habitat conditions, there are many uncertainties regarding the impact of various forest management practices on the herd. However, regional biologists who have studied the Tweedsmuir-Entiako Northern Caribou herd generally agree that any increase in winter mortality risk, could jeopardize the long term survival of the population (Steventon et al., 1998).

Winter Habitat Use

During the winter, Northern Caribou in the Tweedsmuir-Entiako herd exhibit preference for two different winter habitats depending on snow conditions; this trend is consistent with use patterns of Northern Caribou herds throughout BC:

1) Low Elevation Winter Range - is comprised of pine lichen habitats which are important to Caribou for their primary source of forage. Caribou are specific in the selection of low elevation sites where they crater and select those with the most abundant terrestrial lichen cover (Cichowski, 1993). The

² Threatened status indicates that the species is likely to become endangered if limiting factors are not reversed (COSEWIC definition). Information on COSEWIC can be found at <http://www.speciesatrisk.gc.ca/>
Through the Species At Risk Act (SARA), a Recovery Implementation Group (RIG) has been established to assess management needs of Northern Caribou in our area and develop a Provincial Recovery Plan.

sites with the highest terrestrial lichen cover are characterized by stands composed of >90% lodgepole pine of about 70 to 140 years of age, have a southerly aspect and xeric, nutrient poor soils (Sulyma, 2001). Because lichens are slow growing and poor competitors against vascular plants, they are most abundant on poor nutrient sites that have stands between 70 and 140 years of age. Therefore, Caribou require substantial areas of mature and old forests within their winter ranges for foraging (Cichowski, 2002).

2) High Elevation Winter Range – Caribou move to higher elevation range as snow depths increase, or become difficult to crater through. As they shift selection to higher elevation habitats, they begin to choose arboreal lichens that they can reach from being on top of the snow. Wind swept alpine areas are also used at this time as a supply of terrestrial lichens. Typically, the alpine areas used by Caribou are above 1300 m with less than a 40% slope and a convex or flat topography, which facilitates the shedding rather than the accumulation of snow.

Influence of Mountain Pine Beetle Attack

Mountain Pine Beetle (MPB) attack in the Laidman Lake RMZ is extremely high; almost all of the mature pine stands have been killed. The impacts from MPB attack on low elevation winter range's with pine-lichen habitat are variable. The greatest impacts to the forest floor vegetation communities will result from defoliation of the dead trees. Defoliation will result in increased ventilation and insulation at the forest floor. It will also result in a flux of litter accumulation, which terrestrial lichens should be able to persist through.

In general, sites in a current state of lichen presence on the forest floor are expected to respond favourably to defoliation. Sites with moss on the forest floor; however, will likely remain in a moss-dominated state even after the mortality of pine trees. The other impact to low elevation Caribou winter range will be a decrease in the snow interception cover provided by the pine. The lack of snow interception may result in unfavourable conditions for Caribou.

The majority of the high elevation winter range types are dominated by a forest cover of sub-alpine fir and spruce. These stands will not likely be as affected by the current MPB epidemic. However, there is a small component of pine in some of the high elevation winter range that will be affected. The influence of bark beetle attack on arboreal lichens should be favourable. Defoliation will provide a greater amount of suitable anchor substrate for *Bryoria* spp. (Goward, 1998). Likewise, a shift in the microclimate will also occur. This change should allow *Bryoria* spp. to grow lower on the trees making it more available to Caribou (Stevenson and Coxson, 1999, Stevenson *et al.*, 1999). By contrast, *Alectoria* spp. does not respond favourably to opening up the canopy of the stand and will likely decline in abundance (Stevenson and Coxson, 1999). As projected in low elevation habitats, a negative influence of the defoliation of beetle killed pine stems will be a reduction in the snow interception cover.

We know that as MPB attacked trees die, coarse woody debris will increase through wind-fall; however, we are uncertain about how quickly this will happen, and what effect it will have on Caribou movement and distribution (Stevenson *et al.*, 1998). Many downed trees may impede Caribou movement (Schaefer and Pruitt, 1991), but it is unknown what specific amount could be detrimental. The exact response of Caribou to epidemic mountain pine beetle is unknown; the impacts on snow interception and blow-down will depend upon the initial tree density, percentage of trees killed, and

the size of the trees killed (Cichowski et. al., 2001). Some speculate that a combination of increased blow-down, and a reduction of cover available in the low elevation pine-lichen types, may make the intact high elevation habitat types more important over time. Whether Northern Caribou will use high elevation types more or less in the near future is unknown.

Uncertainties associated with MPB in the Laidman Lake RMZ enhance the need for monitoring. The greatest impact from beetle attack on low elevation winter range will be associated with the forest floor vegetation communities, as they respond to defoliation of dead trees and changing microclimate conditions. Monitoring of UWRs and stands effected by MPB outbreak is required to measure shifts in microclimate that may effect lichen growth and evaluate the overall impact on Caribou habitat suitability. Research and monitoring (i.e. establishment of long-term plots and Caribou response) is an important knowledge gap to fill for effective long-term management of Northern Caribou and their habitat.

The Vanderhoof Forest District has been operating under a "Bark Beetle Regulation", which designated emergency bark beetle management areas and units (i.e. aggressive units/sanitation units) as the basis for developing management strategies to deal with the bark beetles. Within these zones, forest licensees applied aggressive forest health management programs. Application of different forest health management strategies will affect the Tweedsmuir-Entiako Northern Caribou herd. Applying extensive and/or intensive forest health management practices (i.e. salvage and sanitation harvesting) to address beetle outbreak introduces disturbance-effect risks to Caribou, many of which are related to access creation. Creation of roads/trails needed to apply MPB control measures have the potential to yield habitat disturbance through increased human activity (i.e. recreation, hunting etc.) and may provide easy routes for predators (wolves) to enter Caribou habitat (Seip and Cichowski, 1996). The high value Northern Caribou habitat within the Laidman Lake RMZ falls within a forest-health salvage strategy (Degagne, pers. com., 2003).

Because of the scale and stage of the MPB epidemic in the Vanderhoof Forest District, the Bark Beetle regulation no longer applies to this RMZ because it is all a "salvage zone" (i.e. it would now be unlawful to conduct snip & skid operations under Bark Beetle regulation as sanitation is no longer applicable in the UWRs). The harvesting that will occur within UWRs will mainly be salvage harvesting of MPB impacted pine, and these operations must be conducted in a manner that meets the specified General Wildlife Measures (See pg 24-28).

Predation Risks

Caribou require enough habitat at the landscape scale to spatially avoid predators like bears and wolves. Bear predation during early summer contributes to mortality (Cichowski, 2002), but wolves are the most significant predator on most Northern Caribou populations including the Tweedsmuir-Entiako herd. Increased moose populations may be related to past and current caribou declines because they sustain greater numbers of wolves (Seip, 1992). Human caused disturbance, (i.e. through forest harvesting openings and road building) has fragmented large tracts of suitable habitat and increased the distribution of early seral habitats across the landscape. Deer, elk, and moose utilize early seral forest stands and in turn attract predators, which increases pressure on Caribou populations. Seip (1992) suggested that wolf predation can eliminate Caribou from areas where the wolf population is sustained by other prey species, because there is no negative feedback on the number of wolves as Caribou numbers decline. Thus, wolves could persist on moose as they extirpate local Caribou populations (Cichowski, 2002). How available space is distributed on the landscape in the

form of early winter, late winter, spring, and summer habitat is an important limiting factor for the long-term persistence of Northern Caribou (Seip and Cichowski, 1996). Road-networks created by forest harvesting also contribute to the predation of Caribou by wolves, as wolves may travel more easily on winter ploughed roads to access Caribou habitat.

Displacement Risks

Many roads also provide access to Caribou habitat to backcountry recreationists, which may have an impact on Caribou habitat and populations. Snowmobiling is a noted concern for the Tweedsmuir-Entiako herd (Cichowski, 2002). Chronic disturbance in a winter range stresses Caribou, leading to reduced body condition (Radle, 2003). Caribou may be displaced from preferred habitat as a result of human disturbance. Caribou may also eventually abandon habitats after being repeatedly disturbed from motorized vehicles (Vanderstar, 2003). This may have population-level impacts if reproductive rates, survival, or recruitment are affected (Simpson and Terry, 2000). Therefore, access management techniques should be utilized to control mechanized access to prevent displacement of Caribou from their habitat. Tools available to manage conflicts between Caribou and snowmobiles include land-use zoning by elevation, activity, and/or by date. Area limitations, seasonal closures, or altitude restrictions may also be combined with access corridors (Brade, 2003).

Risks To Food Availability

Forest harvesting and silvicultural techniques may disturb terrestrial lichens. Lichen regeneration is slow, so forest harvesting has long term implications for caribou winter habitat. However, there are harvesting techniques that minimize disturbance to lichens (for example, winter logging when there is adequate snow cover). At the landscape level, forestry operations usually result in a patchwork of different forest age classes. This fragmentation may lead to avoidance and possibly abandonment of that portion of the winter range (Smith *et al.*, 2000).

Methods

Selection of Ungulate Winter Range Units

Within the Vanderhoof Forest District, the Laidman Lake and Entiako Resource Management Zones (RMZ) have a long history concerning management issues around Northern Caribou (*Rangifer tarandus caribou*). These have been expressed in Provincial Land Use Planning initiatives starting with the Blackwater Local Resource Use Plan, and later being incorporated into the Vanderhoof Land and Resource Management Plan (LRMP). The wildlife objective pertaining to Caribou from the Vanderhoof LRMP is to “*manage for general biodiversity with an emphasis on Caribou*” (MOF, 1997). The Northern Caribou that use this area are referred to as the Tweedsmuir-Entiako herd. In the late 1980’s and early 90’s Cichowski (1993), and Cichowski and Banner (1993) conducted extensive work identifying the movements and habitats used by this herd. It was found that the area of the Entiako RMZ (now encompassed by the Entiako Protected Area) was the most important habitat, in the Ministry of Environment’s Omineca Region (Cichowski and Banner, 1993). Portions of the adjacent Laidman Lake RMZ, however, are also important towards the success of this herd, and are the focus of this report.

Objectives for the process of selecting UWR units focused on:

- reviewing existing UWR/Caribou strategy line-work and recommending any boundary changes required to improve winter range quality;
- identifying areas that are necessary to meet the winter habitat requirements of Caribou, and
- ensuring areas are distributed in the most effective way for maintaining Caribou across their natural range.

It is important to note that several factors that influence ungulate population viability and survival were not fully addressed in the selection of the UWR units; these include:

- intra and inter-specific competition
- predation risk
- connectivity (among winter or other seasonal ranges including critical habitats)

UWR units were identified utilizing the ³best scientific information currently available. Several layers of information were considered and assessed; generally, where the data sets below showed good levels of correlation a UWR unit is proposed:

Caribou Habitat Mapping; reported in Cichowski and Banner (1993):

The Caribou habitat mapping reported in Cichowski and Banner (1993) provided a key data source. This information was mapped as a scale of 1:50,000 according to ecosystem mapping procedures outlined in Banner *et al.* (1986) and Mitchell *et al.* (1986) (from Cichowski and Banner, 1993). The mapping provided detailed information regarding low elevation ecosystems; in addition, the authors developed caribou management zones for the herd area, which were based on the caribou habitat mapping and caribou use of the range area (Cichowski and Banner, 1993).

Caribou Habitat Assessment Supply Estimator (CHASE) Model:

A key source of information utilized in this project was overlays developed using the Caribou Habitat Assessment Supply Estimator (CHASE) model (McNay *et al.*, 2003), which provides the best scientific based approach available to date for the identification of low elevation UWR units for Northern Caribou (Sulyma and Arthur, 2004). The ⁴CHASE model has four sub-model routines to express the value of range types used throughout the year (calving and summer range, low elevation pine-lichen winter range, high-elevation winter range, and movement corridors). For this project, we were only concerned with High Elevation winter range and Low Elevation (pine-lichen) winter range sub-models. These 2 sub-models were run to determine the sites on the landscape that had the best combination of ecological characteristics to provide winter habitat.

³ The reliability of source data/map input data is often a concern. However, until more reliable data sources are available, resource managers must work with existing data sets. Likewise, as new data sets become available, they should be used to update the proposed UWR's. The process fits well into an Adaptive Management framework, which involves a six-step procedure (Nyberg, 1999): 1) problem assessment, 2) project design, 3) implementation, 4) monitoring, 5) evaluation, and 6) project adjustments (then repeat steps 1- 6).

⁴ Detailed information on the CHASE model can be found through Slocan Forest Products Ltd., Mackenzie Division – Integrated Resources Management URL site: <http://www.slocan.com/irm/projects/caribou/model/index.html>

TRIM maps were used for all terrain information applied in the CHASE model. Ecological based mapping TEM and PEM was available for the Laidman Lake RMZ portion of the study area only. It was used as the source data for the high elevation winter range sub-model. In the remainder of the study area Forest Cover information provided the primary data. Forest Cover (FC) information was selected as the source information in the low elevation (pine-lichen) winter range sub-model. It provided a higher level of accuracy in the Laidman area for identifying pine-lichen types relative to the ecological based mapping that was available (Sulyma, 2002).

Development of Low Elevation UWR with delineated Terrestrial Lichen Habitat (TLH) Units:

Due to the complexity of winter life requisite requirements of Northern Caribou and the different scales at which these requirements are managed, the concept of spatially delineating the smaller Terrestrial Lichen Habitat (TLH) units (for low elevation winter range) within the larger UWR units evolved during discussions with professionals and technical experts involved in development of this proposal. The CHASE model was run on the study area, and the following steps provide a general summary of the procedures used to produce the low elevation TLH units and resulting low elevation UWRs (Brumovsky, 2003):

1. **Pine Lichen Capability Mapping** - A pine lichen winter range (PLWR) capability map was produced following the procedures documented in the CHASE Model User's Guide (Doucette *et al.*, 2003). This output map shows where the 'preferred' pine lichen capability areas are within the land base that was modelled.
2. **Identification of buffered polygon** - A 500m circular majority filter was applied to the preferred PLWR capability cells to create a layer which groups clusters of PLWR cells and discards isolated PLWR cells. The buffered polygons were then generated by buffering the 'filtered' preferred PLWR capability groups by a distance of 3000 m.
3. **Identification of TLH Units** - An intersection of the buffered polygon and **un**-filtered preferred PLWR capability cells was then performed to obtain a data set showing all preferred PLWR polygons within the newly identified buffered polygon. Preliminary TLH units were created by buffering all preferred PLWR capability cells by 200m. Preliminary TLH units ≤ 200 ha were discarded, leaving the final TLH unit polygons.

MOE then grouped the buffered polygons based on spatial arrangement and scale (i.e. a small buffered polygon containing only one TLH could be grouped to be managed with another larger and/or small buffered polygon and TLH). The resulting groupings of buffered polygons and enclosed TLHs together form the final proposed low elevation UWR polygons.

In some cases, the boundaries of the UWR were adjusted to match TRIM features (i.e. edges of lakes or wetlands, streams, contour lines, cultblock boundaries, existing roads etc.). These adjustments were made to have the final polygon boundary more operationally feasible; however, we made these slight boundary adjustments in a manner that kept the size of the UWR polygon small (as not to unduly increase the impact on timber harvesting land base).

Aerial Reconnaissance of Modeled Terrestrial Lichen Habitat Units

In early fall of 2004, an aerial reconnaissance of modeled terrestrial lichen habitat was conducted for a suite of draft Low Elevation UWRs to determine the accuracy of the CHASE model outputs, and to also assess input parameters (Sulyma, and McNay, 2004). The results of this work were used to formulate the final proposed UWR polygons (several previously considered units were dropped where model outputs were found to over-predict the presence of terrestrial lichens). Thus the final UWR units, as presented in this UWR proposal, are well supported by the results of the aerial reconnaissance work (Sulyma, and McNay, 2004).

Telemetry

Cichowski and Banner (1993) delineated Caribou Management Zones that classified areas into high, moderate and low value caribou winter range. This work used 5 years of radio-collared Caribou winter location data (1983/84 to 1987/88) (Marshall, 1985), and we used the zoning as one layer of supporting evidence for the selection of the UWR polygons. In addition we considered locations from telemetry of collared Caribou (unpublished data on 2001 and 2002 locations) in establishing these UWR polygons (Marshall, 2004 pers. comm.).

Development of UWR General Wildlife Measures

The General Wildlife Measures (GWMs) for the Northern Caribou UWR follow the intent of the ⁵Vanderhoof Land and Resource Management Plan (LRMP) for the Laidman Resource Management Zone (RMZ), which is to maintain quality Caribou habitat and movement opportunities, while providing opportunities for forest harvesting. “This requires maintaining a variety of landscape and stand conditions, with greatest emphasis on maintaining adequate forest cover to facilitate Caribou movement across the landscape, maintaining high-value terrestrial lichen sites, preventing increased predation on Caribou, and minimizing human disturbance” (McAllister, 2001).

To write the UWR accompanying GWMs, we considered direction from the Vanderhoof Forest District’s Caribou Management Strategy (McAllister, 2001). This document had been considered District Policy by the Ministry of Forests, Vanderhoof Forest District (MacDougall, pers. comm., 2002). There are several important differences between the Caribou Management Strategy (CMS) (McAllister, 2001) and this Ungulate Winter Range (UWR) initiative. The CMS was a tool developed through consideration of overall Caribou management. Whereas, the UWR in this proposal are focused (as the name implies) only on areas identified as necessary for the winter survival of the ungulate species. Also, UWRs were developed using the best scientific information available, and considered information unavailable at the time of the CMS’s development (i.e. CHASE model runs).

Consultation

A detailed summary of consultation and stakeholder feedback can be seen in Appendix 1.

⁵ The LRMP was developed by a planning group (a cross section of public participants with local, regional and provincial interests, and agency staff). Participants represented a wide range of values, including water, fisheries, heritage, culture, recreation, tourism, wildlife, agriculture, mining, timber, access and conservation interests.

Draft UWR units were presented to a suite of Professional Biologists with expertise in establishing UWR, and/or Caribou and Caribou habitat, and to members from the ⁶Northern Caribou Technical Advisory Committee. The line work was refined based upon feedback from technical experts and presented in a general information package to forest licensees, Ministry of Forests, and First Nations. This process repeated itself several times throughout the development of the final UWR proposal.

Simultaneously, various stakeholders interested in the Vanderhoof Forest District were consulted by MOE throughout the process of designating UWR. Local knowledge was obtained from: Ministry of Forests staff, Ministry of Environment staff (i.e. Ecosystem Biologists, Wildlife Specialists, and Vanderhoof Conservation Officers), as well as members of the local Vanderhoof Fish & Game Club. The ⁷Vanderhoof Innovative Forest Practices Agreement (IFPA) members were also consulted throughout the process and their local knowledge was utilized in the selection of UWR areas. The Vanderhoof IFPA includes the following forest licensee members:

- L&M Lumber
- Canadian Forest Products Ltd. (Canfor)
- Canfor Plateau (formerly Slocan Plateau)
- Fraser Lake Sawmills
- Lakeland Mills
- BC Timber Sales

MOE also conducted a cursory check of relevant Forest Development Plans, but we relied on forest licensees to notify us of any potential conflicts with Forest Development Plans (Appendix 2).

Introductory consultation with MOF, MSRM, and forest licensee stakeholders began in September/02 and review of preliminary draft UWR areas and accompanying rational reports/management objectives in mid-November/02. An updated draft of the UWR packages was distributed on March 4/03. Further refinement of the UWR polygons and management objectives occurred up until the end of June/04, and stakeholders were kept updated on the development of the process. Notice of an opportunity to review and comment (4-week period) on the UWR units and then management objectives was given between July 16 and August 13/04 (Appendix 1&2). In December 2004, MOE made several modifications to the spatial UWR polygons, and in early 2005 MOE changed draft management objectives (planning requirement) into General Wildlife Measures (forest practices; see pg 24-28). The UWR proposal was then re-referred out in August 2005 for a final 4-week period.

First Nations Consultation occurred from mid-March to end of June/03, and due to the 04/05 proposal changes was re-referred out in August 2005 for another opportunity to review and comment. Based on advice from the Ministry of Forests Aboriginal Liaison Officer, final draft Northern Caribou UWR packages were sent to the following 4 First Nations:

⁶ The Northern Caribou Technical Advisory Committee is a group of Biologists and technical experts including representatives from MOE, MSRM, MOF, Canadian Wildlife Service, First Nations, Forest Industry, BC Snowmobile Federation, BC Wildlife Federation, Guide Outfitters Association etc. It operates under the National Recovery Team and Joint Steering Committee for the Southern Mountains National Ecological Area (i.e. over-arch is the Species at Risk Act).

⁷ The Vanderhoof IFPA was established in 1999 and essentially is an industry-government partnership including communities, resource users, and First Nations. Their mandate is to be leaders in the development and implementation of innovative forest practices for the forest district land base.

- Cheslatta Carrier Nation
- Lhoosk'uz Dene Government Administration
- Saik'uz First Nation
- Ulkatcho First Nation

Specific feedback and concerns are recorded in Appendix 2, Summary of Stakeholder Feedback.

Significant Changes Resulting from Consultation

Throughout the development of this UWR proposal several changes were made to both the spatial polygons and the accompanying management objectives based on the feedback received throughout the consultation phase. Detailed consultation is presented in Appendix 1&2; the more significant changes to this UWR proposal that resulted from ongoing consultation are listed below:

- We re-ran an updated version of the CHASE model (McNay et al., 2003) (second run), which spatially delineated Terrestrial Lichen Habitat (TLH) units by buffering the preferred pine lichen habitat on low elevation winter ranges. Completing this additional work was in alignment with forest licensees' and MOF requests to spatially delineate the TLH units within the UWR units, and it is consistent with the approach used by the Mackenzie and Ft. St. James Northern Caribou UWR process, (parallel UWR initiatives in the Omineca region). UWR polygon boundaries and management objectives were subsequently revised.
- Several adjustments to the UWR boundaries were made after MOE conducted a March 29/04 overview flight of the proposed UWR.
- The UWR objectives were revisited after Canfor (Mackenzie Division) completed an Operability Assessment of UWR units under the direction of the ⁸technical working group for the Northern Caribou UWR in Mackenzie and Ft. St. James (a parallel UWR initiative).
- Discussions from an April 13/04 meeting with the ⁹Northern Caribou Recovery Implementation Group (RIG) for North-Central British Columbia resulted in several more adjustments to the UWR draft management objectives.
- Discussions with Professional Biologists during an April 21/04 meeting with the Northern Caribou Technical Advisory Committee resulted in several more adjustments to the UWR polygons and management objectives, most notably:
 - refinement of the low elevation UWR units
 - objectives for high elevation winter range changed to specify “no forest harvesting” to avoid increased access, human disturbance, fragmentation, and alteration of predator-prey relationships (see section on management objectives below)

⁸ The development of UWR in Mackenzie and Ft St James Forest Districts has occurred through a technical working group comprised of MWLAP Biologists, Forest Licensees, MOF, and First Nations. This group has developed UWR proposals for different northern caribou herds through a collaborative process through a series of technical workshops.

⁹ The Northern Caribou Recovery Implementation Group for North-Central British Columbia was formed as a result of the direction of the Species at Risk Act; this group will be making a recovery plan for northern caribou for the Chase, Wolverine, Scott, and Finlay herds (primarily in Mackenzie and Ft. St. James Forest Districts).

- The aerial reconnaissance over proposed low elevation UWR essentially compared field observations to CHASE-model predicted terrestrial lichen habitat, thereby assessing the accuracy of the model in the geographic area of the Laidman RMZ. The results lead to several adjustments to the selection of final UWR polygons (3 previously considered UWR units with model predicted TLHs were dropped) where model outputs were found to over-predict the presence of terrestrial lichens (Sulyma, and McNay, 2004).

Proposed UWRs

Northern Caribou Ungulate Winter Range Units for the Vanderhoof Forest District

6 UWR units were derived, which include 3 High Elevation UWRs, and 3 Low Elevation UWRs (Figure 2 & 3).

- High Elevation UWR units are named HE-1-001 Mt_Davidson, HE-3-001 Naglico_Hills, and HE-4-001 Fawnie_Nose.
- Low Elevation UWR units are named LE-1-001 Williamson_Lake, LE-2-001 Johnny_Lake, and LE-4-001 Entiako_VanTine. Two of the low elevation UWR units, LE-1-001 Williamson_Lake and LE-2-001 Johnny_Lake, have delineated TLH units; whereas, LE-4-001 Entiako_VanTine does not.

Figure 2: Resultant High and Low Elevation Ungulate Winter Ranges Proposed for the Vanderhoof Forest District:

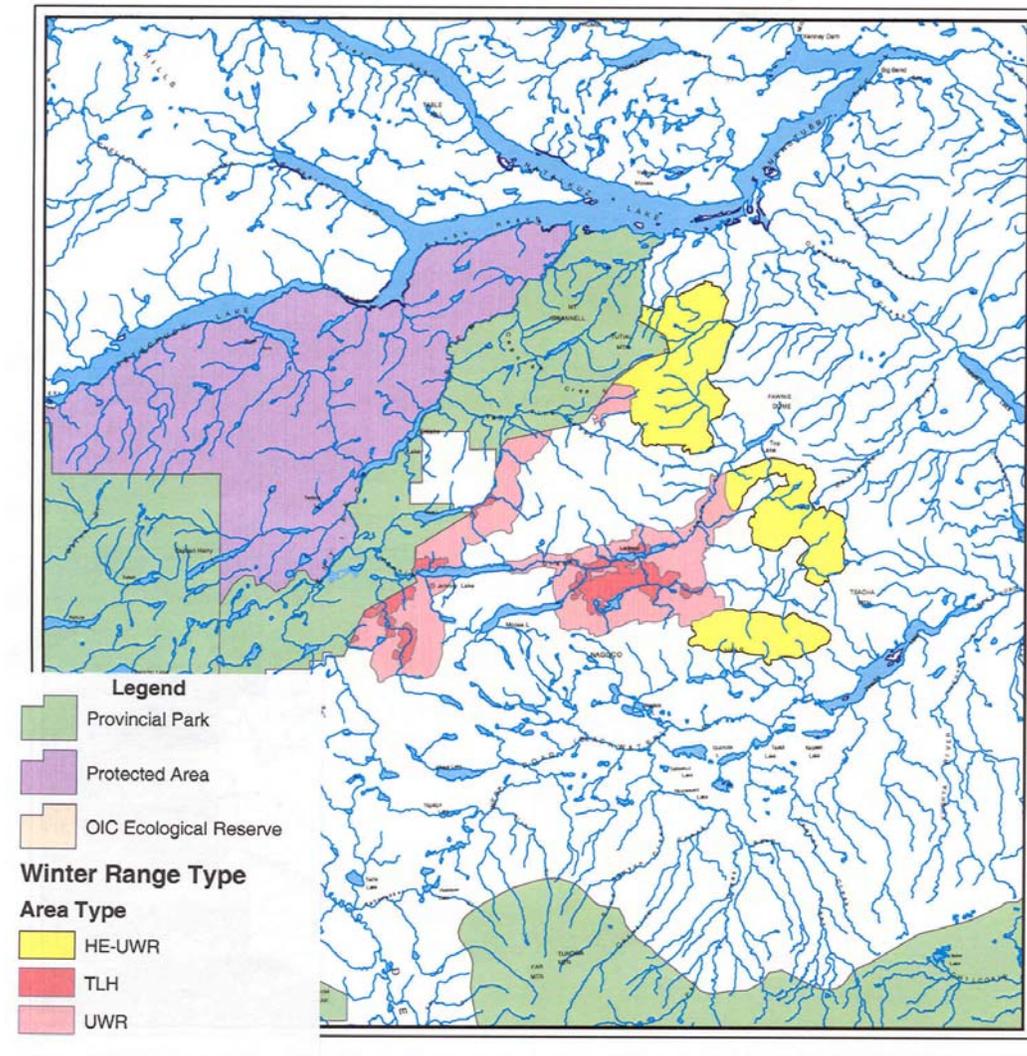


Figure 3: Proposed Northern Caribou Ungulate Winter Ranges for the Vanderhoof Forest District.

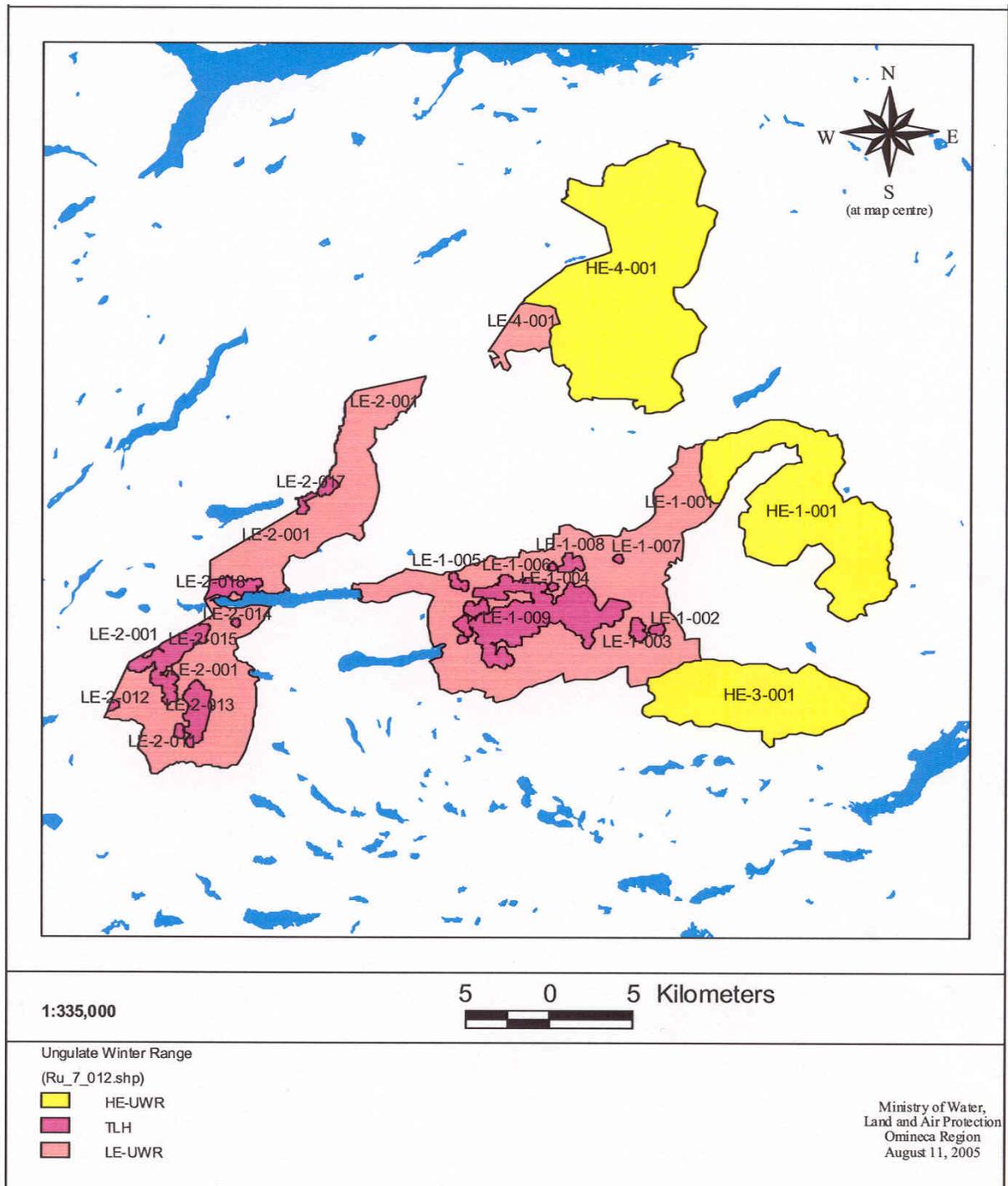
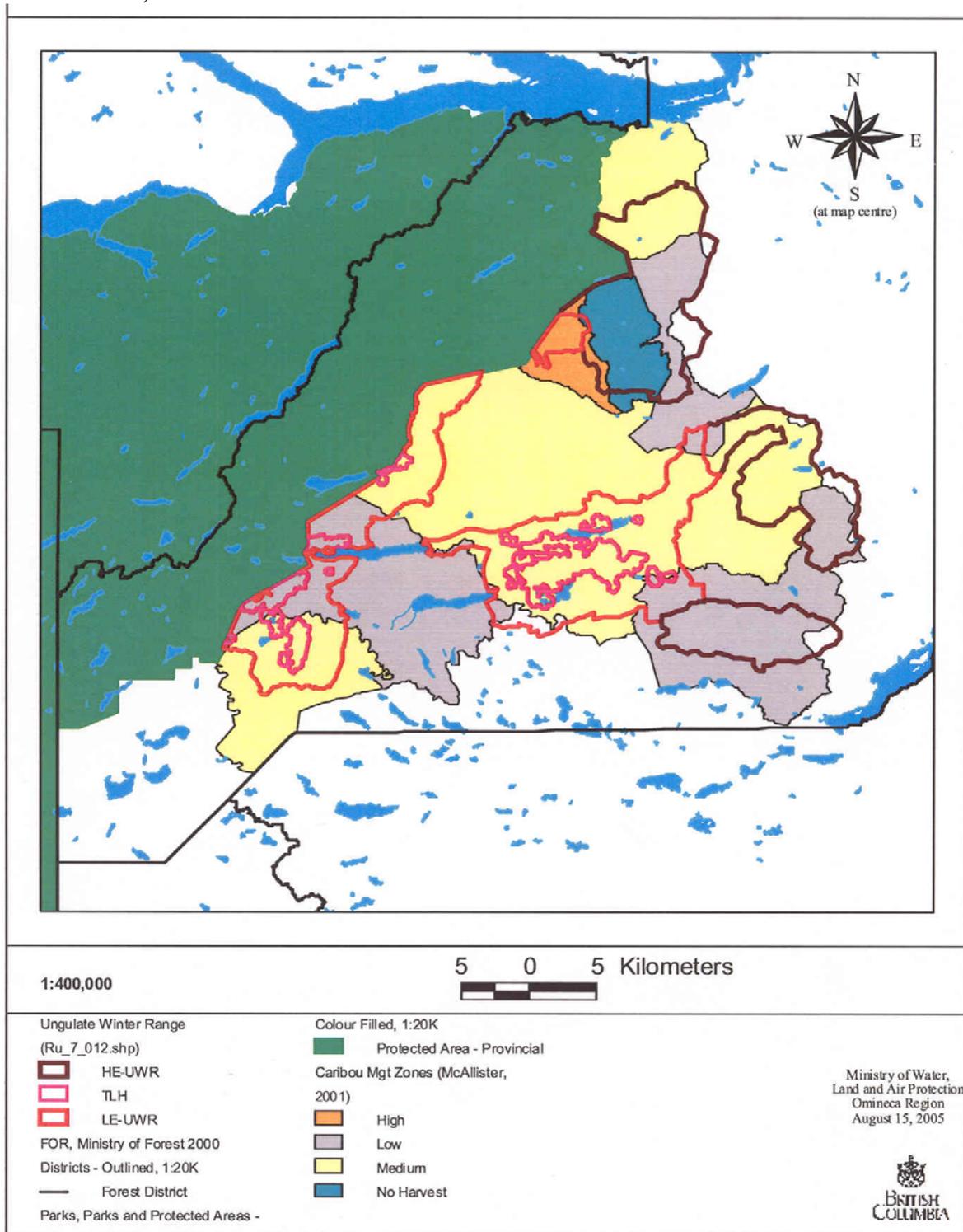
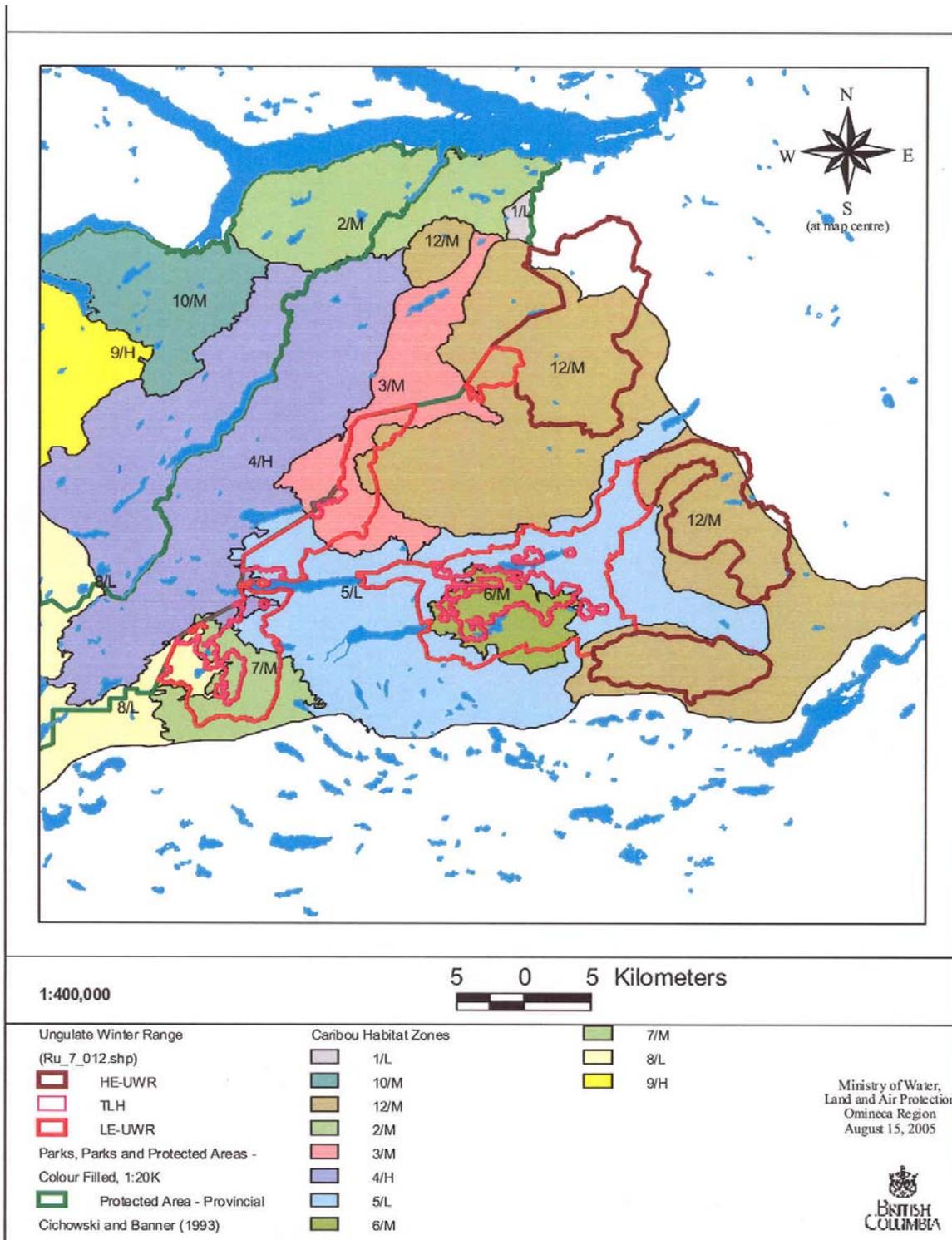


Figure 4: Comparison of UWRs and ¹⁰ Caribou Management Strategy (McAllister, 2001) for Northern Caribou; Vanderhoof Forest District.



¹⁰ McAllister's 2001 Caribou Management Strategy has been considered district policy. Though the proposed UWR polygon boundaries have been adjusted relative to the existing caribou strategy, in general, they do coincide.

Figure 5: Comparison Between UWRs and ¹¹Cichowski and Banner's (1993) Caribou Management Zones.



¹¹ Cichowski and Banner's (1993) Caribou Habitat Mapping is the key data source for these broad caribou management zones (low, medium, and high). Generally, there is good correlation between these zones and the UWR units.

Timber Harvesting Land Base and Resource Impacts

MOE may establish UWR of different types, as related to their impact on the Timber Harvesting Land Base (THLB). This UWR proposal for Northern Caribou in the Vanderhoof Forest District can be categorized as “Type I” or “Type II UWR”. Type I UWR means that the UWR are specified by spatially explicit units that have been incorporated into Timber Supply Review (TSR) I or TSR II allowances. Type II UWRs are enabled through the spirit and intent of Land and Resource Management Plans (LRMP). The following is from Doug Beckett, Regional Timber Supply Analyst for the Ministry of Forests, Northern Interior Forest Region:

“The Chief Forester accounted short and long-term timber supply impacts of up to 0.9 percent in his incorporation of the Vanderhoof Forest District caribou habitat management strategy. This equates to a long-term timber supply impact of up to $(8,794,000\text{m}^3/\text{year} * 0.900) = 79,146 \text{m}^3/\text{year}$. $79,146\text{m}^3/\text{year} / 2.6 \text{m}^3/\text{ha}/\text{year} = 30,441 \text{ hectares of THLB}$. Thus, the ungulate Type I or Type II budget would be up to 30, 441 hectares of THLB.”

The total area of the proposed UWRs is 48,696.4 ha of which 22,629.24 ha is High Elevation UWR and 26,067.17 ha is Low Elevation UWR. The total hectares of THLB within the UWRs totals 29,254.26 hectares at 100% netdown (Table 1). Thus, we know the impact on THLB is within the Type I / II allowed budget. The actual impact on THLB will be less than 100% netdown; actual THLB impact numbers will be provided as an addendum once the MOF Timber Analyst provides the analysis.

Table 1: Summary of THLB by UWR unit for Northern Caribou UWR in Vanderhoof Forest District (U-7-012)

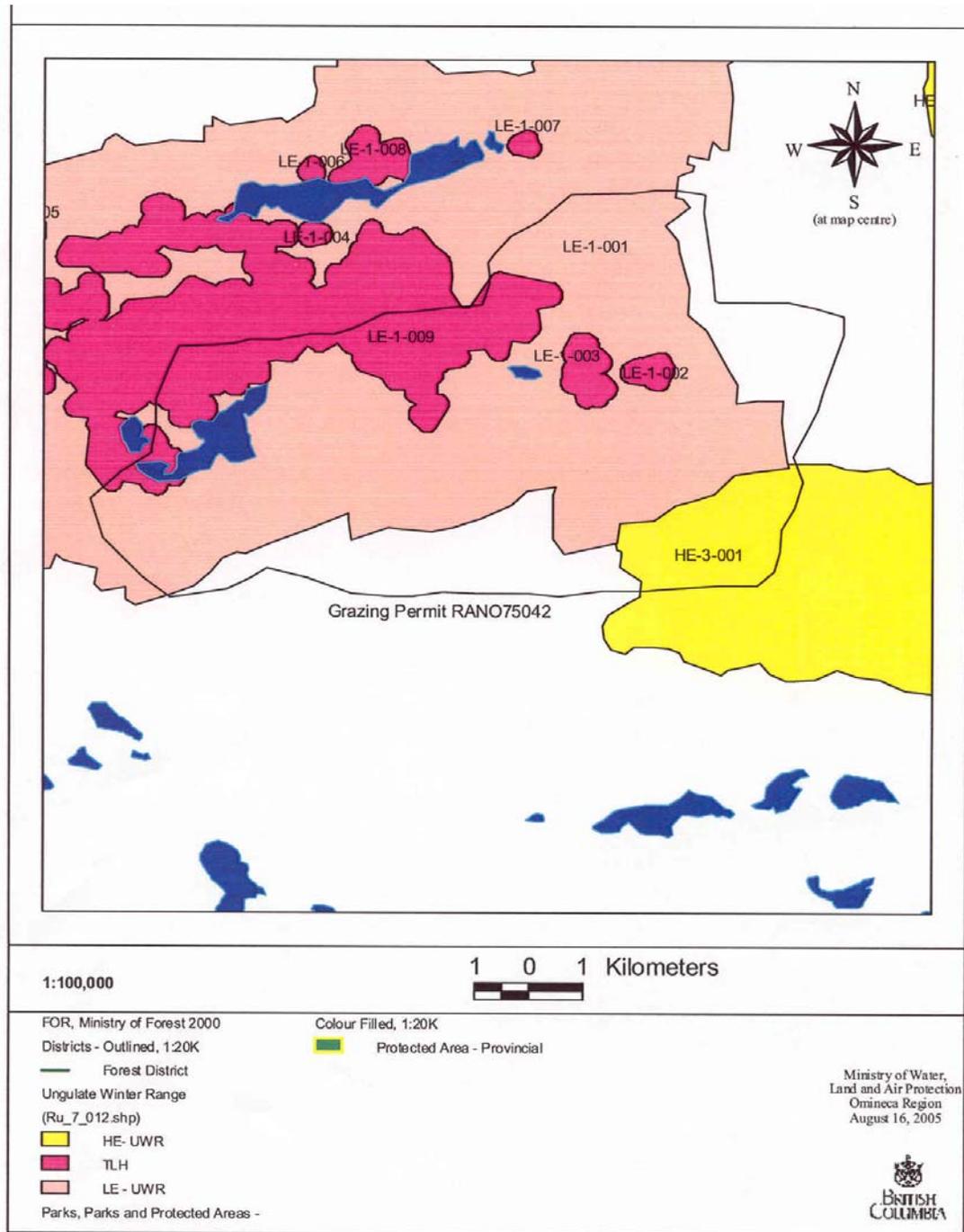
UWR_NAME	TYPE	UNIT_NO	THLB (ha)
HE-1-001 - Mt_Davidson	High Elevation UWR	HE-1-001 Total	3,082.69
HE-3-001 - Naglico_Hills	High Elevation UWR	HE-3-001 Total	3,585.94
HE-4-001 - Fawnie_Nose	High Elevation UWR	HE-4-001 Total	3,883.22
LE-1-001 - Williamson_Lake	Low Elevation UWR	LE-1-001 Total	7,605.67
	Terrestrial Lichen Habitat	LE-1-002 Total	24.60
	Terrestrial Lichen Habitat	LE-1-003 Total	60.08
	Terrestrial Lichen Habitat	LE-1-004 Total	6.85
	Terrestrial Lichen Habitat	LE-1-005 Total	50.43
	Terrestrial Lichen Habitat	LE-1-006 Total	15.30
	Terrestrial Lichen Habitat	LE-1-007 Total	15.25
	Terrestrial Lichen Habitat	LE-1-008 Total	84.59
	Terrestrial Lichen Habitat	LE-1-009 Total	2,031.74
LE-2-001 - Johnny_Lake	Low Elevation UWR	LE-2-001 Total	7,065.97
	Terrestrial Lichen Habitat	LE-2-011 Total	7.61
	Terrestrial Lichen Habitat	LE-2-012 Total	0.00
	Terrestrial Lichen Habitat	LE-2-013 Total	282.30
	Terrestrial Lichen Habitat	LE-2-014 Total	19.47
	Terrestrial Lichen Habitat	LE-2-015 Total	403.10
	Terrestrial Lichen Habitat	LE-2-017 Total	94.50
	Terrestrial Lichen Habitat	LE-2-018 Total	210.08
LE-4-001 - Entiako_Vantine	Low Elevation UWR	LE-4-001 Total	724.87
		Total	29,254.26

Canfor Plateau (formerly Slocan Plateau) has planning cells that overlap with the UWR polygons, and they have expressed general concern (Appendix 2). However, as previously noted, the proposed UWR generally coincide with the Caribou Management Strategy for Vanderhoof (McAllister, 2001), under which forest licensees have been operating for more than one year. Furthermore, Forest Licensees have been involved in the development of this proposal starting in 2001, as documented in this report's summary of consultation section (pg 14-15, and Appendix 2). MOE conducted a cursory check of relevant Forest Development Plans, but relied on forest licensees to provide notification of any potential conflicts with Forest Development Plans (Appendix 2). No other licensees besides Canfor Plateau (formerly Slocan Plateau) have notified MOE that their Forest Development Plans are in conflict with this UWR proposal.

In terms of overlap with mineral exploration, the whole Laidman RMZ and the Fawnie Mt. area are amongst the highest mineral exploration potential left outside of Parks protection in the Vanderhoof LRMP (Blackwell, pers. com., 2003). As such, the high elevation UWR, HE-1-001 Mt_Davidson, HE-3-001 Naglico_Hills, and HE-4-001 Fawnie_Nose, overlap areas with historical mineral exploration tenure and activities. Proponents will likely request roaded access to advance and develop tenured properties over time. The mineral planner from MSRM that was consulted during the development of Caribou UWR advised that while winter access for mineral tenure holders may not be a requirement for the immediate future, MOE shall ensure Ministry of Energy and Mines is aware so that the UWRs and accompanying General Wildlife Measures can be incorporated into permitting. The Low Elevation UWRs (LE-1-001 Williamson_Lk, LE-2-001 Johnny_Lk, and LE-4-001 Entiako_VanTine) do not appear to have overlap with mineral exploration targets (Blackwell pers. com., 2003).

A range tenure / grazing permit overlaps with a large portion of LE-1-001 (Williamson Lake area) and several associated TLHs, namely LE-1-009, LE1-003 and LE1-002 (Figure 6). Approximately 1019.9 ha of delineated terrestrial lichen habitat within UWR LE-1-001 overlaps with this grazing permit. The majority of livestock grazing occurs mostly on roads, landings, and cutblocks and the sedge and grass meadows associated with Mathews Creek and Williamson Lake drainages, and cattle use of the terrestrial lichen areas is low and incidental (Tabe, pers. com., 2005). Nonetheless, it will be important to ensure that terrestrial lichens are not converted to forbe and moss cover as a result of range activities; measures to prevent cattle from damaging terrestrial lichen sites should be incorporated into applicable Range Use Plans.

Figure 6: Overlap of Ministry of Forest's Grazing Permit (RAN075042) with UWR HE-3-001, LE-1-001 and TLHs LE-1-009, LE-1-003, and LE-1-002.



General Wildlife Measures (GWMs) to Apply to UWR Units:

Warning

The following general wildlife measures are an unofficial consolidation of the general wildlife measures established within the legal order pertaining to this Ungulate Winter Range. Official ungulate winter range orders may be accessed and downloaded from this Web Site http://www.env.gov.bc.ca/wld/frpa/uwr/approved_uwr.html. While every attempt has been made to ensure accuracy and completeness, these general wildlife measures cannot be guaranteed. **Users should always refer to the official order, which may be amended from time to time.**

Definitions:

Main road is defined as Forest Service Road (FSR) or licensee mainline.

Non main road is defined as any other road that is not a main road

Ungulate Winter Range (UWR) - in this proposal, and UWR consists of the following:

Terrestrial Lichen Habitat (TLH) is a delineated area in a northern caribou UWR where forage lichens (*Cladina* and *Cladonia* species) grow.

Non-Terrestrial Lichen Habitat (NTLH) is the area within the UWR that is not defined as TLH.

High Elevation (HE) Winter Range is defined as habitat for wintering ungulates generally above 1300m; comprised entirely of NTLH.

Low Elevation (LE) Winter Range is defined as ungulate winter range generally below 1300m; comprised of TLH and/or NTLH.

Low Elevation (LE) Winter Range Aggregate is defined as a grouping of low elevation TLH and NTLH polygons.

UWRs are outlined in *Table 2*:

Table 2: Defined Northern Caribou UWRs for which General Wildlife Measures Apply.

UWR_NAME	UNIT_NO	Elevation (High or Low)	Type (TLH or NTLH)	Total Area (ha)
HE-1-001 - Mt_Davidson				
	HE-1-001	High Elevation UWR	Non-Terrestrial Lichen Habitat	6,964.30
HE-3-001 - Naglico_Hills				
	HE-3-001	High Elevation UWR	Non-Terrestrial Lichen Habitat	4,605.59
HE-4-001 - Fawnie_Nose				
	HE-4-001	High Elevation UWR	Non-Terrestrial Lichen Habitat	11,059.34
LE-1-001 - Williamson_Lake				
	LE-1-001	Low Elevation UWR	Non-Terrestrial Lichen Habitat	10,955.41
	LE-1-002	Low Elevation UWR	Terrestrial Lichen Habitat	52.77
	LE-1-003	Low Elevation UWR	Terrestrial Lichen Habitat	108.03
	LE-1-004	Low Elevation UWR	Terrestrial Lichen Habitat	25.25
	LE-1-005	Low Elevation UWR	Terrestrial Lichen Habitat	78.65
	LE-1-006	Low Elevation UWR	Terrestrial Lichen Habitat	20.79
	LE-1-007	Low Elevation UWR	Terrestrial Lichen Habitat	25.27
	LE-1-008	Low Elevation UWR	Terrestrial Lichen Habitat	123.13
	LE-1-009	Low Elevation UWR	Terrestrial Lichen Habitat	2,691.46
LE-2-001 - Johnny_Lake				
	LE-2-001	Low Elevation UWR	Non-Terrestrial Lichen Habitat	9,330.61
	LE-2-011	Low Elevation UWR	Terrestrial Lichen Habitat	46.70
	LE-2-012	Low Elevation UWR	Terrestrial Lichen Habitat	30.40
	LE-2-013	Low Elevation UWR	Terrestrial Lichen Habitat	461.87
	LE-2-014	Low Elevation UWR	Terrestrial Lichen Habitat	20.79
	LE-2-015	Low Elevation UWR	Terrestrial Lichen Habitat	771.02
	LE-2-017	Low Elevation UWR	Terrestrial Lichen Habitat	164.76
	LE-2-018	Low Elevation UWR	Terrestrial Lichen Habitat	281.67
LE-4-001 - Entiako_Vantine				
	LE-4-001	Low Elevation UWR	Non-Terrestrial Lichen Habitat	878.61
Total Area				48,696.42

General Wildlife Measures:

These UWRs are organized in 3 sections: those that apply to all UWR units, those that apply to only High Elevation UWRs, and those that apply to only the Low Elevation UWRs.

1.0 All Ungulate Winter Range Units

To Minimize Displacement:

1.1 Within all UWRs, new main road construction is not to occur, unless there is no other practicable option, and an exemption is provided by the Minister of Environment or delegate.

To Minimize Predation:

- 1.2** Within all UWRs, upon completion of primary forest activities, implement measures on all non main roads to create unfavourable future conditions for wolf and snowmobile travel including, unless an exemption is provided by the Minister of Environment or delegate. An exemption is not required when a non main road is required to access timber beyond.

To Minimize Predation and Displacement, and to Maintain Food:

- 1.3** Within existing and new range tenures that overlap UWR units, do not develop new range features, such as, but not limited to, waterholes, fences, salt blocks/sites, corrals, access roads, and trails, unless an exemption is provided by the Minister of Environment or delegate.

2.0 High Elevation Ungulate Winter Range Units Only

To Minimize Predation and Displacement:

- 2.1** There shall be no forest harvesting within all High Elevation UWRs, with the exception of cutblocks and associated roads approved in a Forest Development Plan at the time of this UWR designation, or unless an exemption is provided by the Minister of Environment or delegate. An exemption would be considered for the purpose of enhancing the quality of winter range. An exemption is not required for harvesting within these UWRs when it is required to address worker safety: felling danger trees within these UWRs along adjacent cutblock boundaries.
- 2.2** No salvage harvesting within all High Elevation UWRs, unless an exemption is provided by the Minister of Environment or delegate. An exemption would be considered for the purpose of enhancing the quality of the winter range. An exemption is not required for single tree sanitation activities to address forest health issues if harvesting is conducted in a manner that does not result in a material adverse impact on the caribou winter habitat within the designated UWR.
- 2.3** Within all High Elevation UWRs, no new main road or non-main road building, and no addition of other access routes (i.e. trails and landings), unless an exemption is provided by the Minister of Environment or delegate.
- 2.4** Within all High Elevation UWRs, regarding maintenance of existing roads, time activities to occur when caribou are not present unless an exemption is provided by the Minister of Environment or delegate. An exemption is not required for:
- (i) Road maintenance activities associated with main roads.
 - (ii) Road maintenance activities required to address sanitation forest health issues.

3.0 Low Elevation Ungulate Winter Ranges LE-1 (all units) and LE-2 (all units). Does not apply to LE-4:

To Minimize Predation:

- 3.1** Unless an exemption is provided by the Minister of Environment or delegate, spatially and temporally plan/implement harvesting (and associated silviculture activities) so that as close to half as possible, of the TLH available in a given UWR is at a successional stage that will provide moderate/class 3 or high/class 4 lichen value as defined in the most recent version of the Ministry of Environment's "Classification Guide for Terrestrial Lichen Habitat in the Omineca Region" (MOE,2005) for a period from now and for 70 years (i.e. 2005 to 2075).
- 3.2** Within each Low Elevation UWR, manage the defined NTLH and TLH through a two pass, 140 year rotation.
- 3.3** Unless an exemption is provided by the Minister of Environment or delegate, within each pass of each Low Elevation UWR, harvest 50 % +/- 20% of the total area of economically viable timber within the aggregate, such that;
- (i) the ratio of TLH to NTLH in harvested areas is equal (+/- 10 %) to the ratio of TLH to NTLH in the entire Low Elevation Winter Range Aggregate;
 - (ii) the harvested area is clumped or grouped in one contiguous area of the Low Elevation Winter Range Aggregate; and
 - (iii) the harvested patches do not fragment individual TLH polygons.
- 3.4** Primary forest activities within each Low Elevation Winter Range Aggregate initiated at the start of a rotation are to be completed within 20 years, unless an exemption is provided by the Minister of Environment or delegate. All resultant interstitial areas within a Low Elevation Winter Range Aggregate not harvested during that 20 year period will be locked into the 140-year rotation.

To Maintain Food:

- 3.5** Within TLHs:
- i) in order to reduce disturbance to terrestrial lichens and soil disturbance or soil mixing, restrict harvest to winter periods when snow cover is sufficient, unless an exemption is provided by the Minister of Environment or delegate. An exemption is not required for soil types with pure sand and >30% coarse fragment content,
 - (ii) in order to maximize lichen regrowth on the harvested area, process trees at the roadside to minimize debris on the cut over area, unless an exemption is provided by the Minister of Environment or delegate, and
 - (iii) do not fertilize.
- 3.6** Within existing and new range tenures that overlap with TLHs range practices must not cause conversion of terrestrial lichen habitat to forbe and/or moss cover.

To Minimize Displacement:

3.7 Within a TLH unit when caribou are present in winter, harvesting, road construction and maintenance are not to occur unless an exemption is provided by the Minister of Environment, or delegate. An exemption is not required for any activities associated with main roads, or harvesting and road building activities required to address sanitation forest health issues.

4.0 Low Elevation Ungulate Winter Range Units Only (LE-1-001 {LE-1-001 to 009}, LE-2-001 {LE-2-011 to 015, 017 and 018}, and LE-4-001):

To Minimize Impacts To Caribou Health From Livestock:

4.1 Within existing and new range tenures that overlap with Low Elevation Winter Ranges, do not introduce domestic animals, such as, but not limited to, domestic sheep, without a full risk assessment to avoid introducing health risks caribou.

Appendix 4, provides MOE's regional guidelines (i.e. recommended best management practices) for managing Northern Caribou winter habitat. They are provided as "guidance" because they are not measurable enough to become GWMs. The guidelines should be implemented simultaneously with the legal GWMs, and professionals preparing operational plans have site-specific discretion and flexibility in prescribing methods to meet the intent of the GWMs and guidelines, which are ultimately designed to achieve a habitat condition that is supportive of caribou.

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Appendix 1: Summary of Targeted Stakeholder Consultation

MWLAP undertook targeted consultations with key government and industry stakeholders and First Nations throughout the development of the proposed UWR that initially began in September of 2002 and finished in September 2005. To achieve a reasonable level of consultation, in addition to ongoing correspondence and updates through email/telephone, several key meetings/presentations were arranged; these are summarized below:

- On July 22/02 and September 13/02 MWLAP met in Prince George with Forest Planners from Canfor to obtain a preliminary exchange of ideas regarding the UWR initiative and process (i.e. confirm geographic scope, species priorities, timeframe, agency roles, and confirmation of information resources).
- On October 18/02 MWLAP met in Vanderhoof with IFPA forest licensee members to introduce the UWR initiative, collect local knowledge, and gather recommendations from various stakeholders. Participants included Canfor, Canfor Plateau (formerly Slocan Plateau), Fraser Lake Sawmills, and L&M Lumber.
- On October 22/02 MWLAP met in Vanderhoof with several MOF staff to introduce the UWR initiative, and collect local knowledge of candidate areas.
- On October 22/02 MWLAP consulted the Vanderhoof district Conservation Officers to discuss the UWR initiative and to gather their local knowledge on potential areas for UWR.
- On November 4/02 forest licensee stakeholders were informed of MWLAP's decision to run the CHASE Model (McNay and Zimmerman, In Progress) on the Vanderhoof project area (Entiako Park, and the caribou management zones that were already identified in the Caribou Management Strategy for the Laidman and Upper Blackwater RMZ). Specifically, stakeholders were informed that Forest Floor Contracting would use the CHASE habitat selection model to identify "high value" Pine-Lichen Winter Range and "high value" High Elevation Winter Range, as a foundation for proposing UWR. No concerns with this approach were identified at this time.
- On November 21/02 a meeting was held in Prince George with government and consulting biologists familiar with caribou and the Laidman area to review the draft UWR polygons and discuss appropriate management objectives.
- At the November 22/02 Vanderhoof LRMP update meeting, MSRM (on behalf of MWLAP) distributed a written update on the UWR initiative. This update described the purpose for the UWR initiative, the intent, timeframe, and the methods used to determine candidate UWR areas. A MWLAP contact was provided if stakeholders wished to find out more information.
- On November 25/02 in Vanderhoof MWLAP presented licensee stakeholders and MOF staff with the preliminary UWR area and their accompanying draft management objectives. At the end of this presentation, MWLAP collected several comments from the discussion and invited

written feedback on the proposed UWRs, the proposed management objectives, and on the methodology/rational used.

- On December 3/02 and December 6/02, MWLAP received written feedback from Canfor and MOF respectively. Based on the comments collected, MWLAP made several adjustments to the draft UWR units and objectives. MWLAP provided written feedback to MOF and Canfor on February 12/03, and February 20/03 respectively (Appendix 2).
- On March 4/03, draft UWR packages were distributed to forest licensees and First Nations stakeholders. A minimum of two follow-up phone calls were made to each First Nation contact throughout May, and a final letter regarding input to the UWR was also issued in May/03.
- On June 2/03 a meeting was held in Anaheim Lake with the Ulkatcho First Nation; they had requested an information meeting in their community after receiving an information package on the proposed UWR and subsequent follow-up phone calls, and letters. MWLAP extended the deadline for input for the Ulkatcho First Nation (to June 30/03) to accommodate their upcoming community meeting where they discussed the UWR initiative.
- On September 4/03 in Vanderhoof, MWLAP and Forest Floor Consulting met with Ministry of Forests and Canfor Plateau (formerly Slocan Plateau) to do an overall review of the UWR process, proposed polygons and draft management objectives. Based on the feedback, MWLAP revised several management objectives and re-ran the CHASE model to delineate TLH.
- On October 22/03 an update email was sent to Forest Licensee, and MOF stakeholders explaining the follow-up work as a result of the September 4/03 meeting. The re-run of the CHASE model and spatial identification of TLH was explained as being a necessary analytical component to align the habitat modeling with the procedures being used for northern caribou UWR development in Mackenzie and Ft. St. James Forest Districts. Stakeholders were notified that this work may result in changes to UWR polygon boundaries.
- At the November 7/03 Vanderhoof LRMP meeting, MSRM (on behalf of MWLAP) distributed a written update on the UWR initiative. This update described the purpose for the UWR initiative, and an explanation of and update on the work completed to date. A MWLAP contact was provided if stakeholders wished to find out more information.
- On February 16/04, MWLAP invited Forest Licensees to an information session on MWLAP priorities, which included a presentation on this UWR. Of the licensees interested in this UWR proposal, only Canfor attended. A copy of the presentation and meeting notes was emailed to the Forest Licensees who were not in attendance.
- On April 13/04, MWLAP participated in the meeting of the northern caribou Recovery Implementation Group (RIG) for the Chase, Wolverine, Scott, and Finlay herds (primarily in Mackenzie and Ft. St. James Forest Districts). Discussions resulted in several more adjustments to the UWR management objectives to achieve regional consistency.
- On April 14/04 MWALP emailed Forest Licensees, MOF, BCTS, MSRM, and professional biologists interested in the UWR with an update. It was made clear that there were some

substantial changes from previous draft versions to both the spatial location of the UWR units and the management objectives resulting from the recent work and various technical discussions.

- On April 21/04, MWLAP participated in the Northern Caribou Technical Advisory Committee meeting. Discussions resulted in adjustments to the UWR units and management objectives.
- In December 2004 MOE made several modifications to the spatial UWR polygons as a result of the aerial reconnaissance results whereby the predictions of the CHASE model were field evaluated and assessed for accuracy.
- In early 2005, MOE changed draft management objectives (planning requirement) into General Wildlife Measures (forest practices; see pg 24-28). The UWR proposal was then re-referred out in August 2005 for a final 4-week period.

Details from the above discussions are documented in:

Appendix 2: Summary of Stakeholder Feedback for Caribou Ungulate Winter Range in Vanderhoof Forest District attached below.

This summary of consultation has grouped the stakeholder comments and concerns under general themes, rather than providing a verbatim account of the many discussions. Participants in the above mentioned process are encouraged to contact Leslie Yaremko (Email: Leslie.Yaremko@gov.bc.ca or phone (250) 614-9901) if they wish to suggest additions, clarifications, or corrections to this summary.

Appendix 3: Table 3: Defined UWRs and Applicable GWMs; Vanderhoof Forest District:

UNIT_NO	UWR_NAME	TYPE	Total Area (ha)	APPLICABLE GWMs
HE-1-001	HE-1-001 - Mt_Davidson	High Elevation UWR	6,964.30	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 2.1.1, 2.2.1, 2.2.2, 2.3.1, 2.4.1,
HE-3-001	HE-3-001 - Naglico_Hills	High Elevation UWR	4,605.59	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.2.1, 2.1.1, 2.2.1, 2.2.2, 2.3.1, 2.4.1,
HE-4-001	HE-4-001 - Fawnie_Nose	High Elevation UWR	11,059.34	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 2.1.1, 2.2.1, 2.2.2, 2.3.1, 2.4.1,
LE-1-001	LE-1-001 - Williamson_Lk	Low Elevation UWR	10,955.41	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-1-002		Terrestrial Lichen Habitat	52.77	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-1-003		Terrestrial Lichen Habitat	108.03	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-1-004		Terrestrial Lichen Habitat	25.25	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-1-005		Terrestrial Lichen Habitat	78.65	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-1-006		Terrestrial Lichen Habitat	20.79	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-1-007		Terrestrial Lichen Habitat	25.27	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-1-008		Terrestrial Lichen Habitat	123.13	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-1-009		Terrestrial Lichen Habitat	2,691.46	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-2-001	LE-2-001 - Johnny_Lk	Low Elevation UWR	9,330.61	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-2-011		Terrestrial Lichen Habitat	46.70	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-2-012		Terrestrial Lichen Habitat	30.40	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-2-013		Terrestrial Lichen Habitat	461.87	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-2-014		Terrestrial Lichen Habitat	20.79	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-2-015		Terrestrial Lichen Habitat	771.02	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-2-017		Terrestrial Lichen Habitat	164.76	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-2-018		Terrestrial Lichen Habitat	281.67	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
LE-4-001	LE-4-001 - Entiako_Vantine	Low Elevation UWR	878.61	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.3.1, 3.3.2
Total			48,696.40	

Appendix 4: Ministry of Environment, Environmental Stewardship, Omineca Region's Guidelines for Managing Northern Caribou Winter Habitat.

These guidelines are intended to compliment the legislated northern caribou UWR General Wildlife Measures, and give further recommendations on how to implement them. These guidelines are not included as part of the legal GWMs because they are less measurable, but are still important practices while planning and operating within and around UWRs. Professionals preparing operational plans have site-specific discretion and flexibility in prescribing methods to achieve desired habitat condition.

Please note that research is currently ongoing around the best strategies to ensure maintenance and/or recruitment of terrestrial lichens. As such, forest practitioners should always seek out the most recent research and apply the best available information.

Definition:

Terrestrial lichen habitat is defined as habitat that has the site characteristics to grown terrestrial lichens. Generally, these habitats are found in pine-dominated forests (>90% pine) that have a site index of less than 14.5, are associated with dry-nutrient poor site series with aspect ≥ 45 and ≤ 315 (Sulyma, 2001). Terrestrial lichen sites tend to have coarse-textured (sand) soils with high coarse fragment content.

To Minimize Displacement:

Further to GWM 1.1

1. Whenever possible, within Low Elevation Winter Range Aggregates (made of groupings of TLH and NTLH) that are not at the end of a road system, scheduling could be done so harvesting is planned to occur in some of the Low Elevation Winter Range Aggregates, rather than having activities in all the units all of the time.
2. In keeping with an adaptive management process, review and update Access Management Plans to consider and incorporate UWRs, so that human use of high value winter caribou habitat is avoided. Access management points may include access closure points by signage and/or physical structures (concrete barriers, deep road trenches, non-ploughed roads etc.), or other proven methods.

Further to GWM 3.5 i) & 3.7

Note 1:

GWM 3.5 i) & 3.7 do not conflict, but rather are to be met simultaneously such that harvesting activities that occur in the winter (with exception of hauling):

1. Minimize mechanical damage to terrestrial lichens, and

2. In a particular year in a particular place, do not displace caribou

Said another way, GWM 3.7 is a further refinement of GWM 3.5 i). If on-ground or aerial surveys confirm that caribou are not occupying the TLH in which activities are desired to commence, then forest operations may proceed. If caribou are present in the TLH in which winter activities are desired to commence, operations can be adjusted (e.g. logging can occur later, even that same winter if the caribou move out of the area, or logging can occur during another winter).

Note 2:

If a company is operating in a TLH and after operations have started up, caribou move into the area, it is not expected that operations shut down. The company must be able to provide evidence and rationale that this set of circumstances had occurred.

1. Road construction and maintenance, harvesting and silviculture activities within any Low Elevation Winter Range Aggregate that are at the end of a road system could be incorporated, planned and scheduled as start up wood or summer harvest.
2. Constraints could be put on individual timber sales of BC Timber Sales or blocks of other licensees that pertain to timing to address minimizing displacement impacts to caribou. This would require coordinated planning between licensees.
3. Forestry operations (road construction/maintenance and/or harvesting) are not to occur within any High Elevation UWR, or within a TLH in Low Elevation UWRs when caribou are present. Forestry operations may proceed only when caribou are not utilizing the specified area where supported by monitoring information completed to professional standards (i.e. on-ground assessments, aerial surveys, etc.) that confirms caribou are not occupying the UWR. Generally, windows of winter caribou use for these UWRs are:
 - a. December 1 to April 15 (late winter) in Low Elevation UWRs (Vanderhoof, U-7-012)
 - b. December 31 to March 31 (late winter) in High Elevation UWRs (Vanderhoof U-7-012)

Due to the seasonal fluctuations in weather and the unpredictability of caribou herds, the above dates are presented as approximations.

To Minimize Predation:

Further to GWM 3.2 & 3.3

1. The specific size and distribution of the TLH units, the current lichen habitat value (MOE, 2005), and the existing harvesting history within each Low Elevation Winter Range Aggregate are some of the key factors that will guide practitioners as to where the best placement will be identified for first and second pass harvesting of the 140 year rotation.

The management intent of the NTLH's and TLH's identified to be part of the second pass harvest is that they are part of the functioning portion of the Low Elevation Winter Range Aggregate. The TLH's should currently have lichen mats with Class 3 or 4 value such that they provide adequate food for caribou right now and temporally through to the point in time when second pass harvesting begins. Said another way, these NTLH's and TLH's are part of the Low Elevation Winter Range Aggregate that will not have any new harvesting or silviculture activities until second pass harvesting is initiated.

The management intent of the NTLH's and TLH's identified to be part of the first pass of harvest is that they are part of the non-functioning half or portion of the Low Elevation Winter Range Aggregate (for 70 years post harvest). Said another way, they are part of the portion of the Low Elevation Winter Range Aggregate that will have harvesting and silviculture activities.

2. When considering which "half" or "portion" of the Low Elevation Winter Range Aggregate will be apportioned to first pass and second pass of the 140 year rotation:
 - identify for second pass, the areas that will, for the duration of time through the first pass timeframe, have the highest probability of providing medium (Class 3) or high (class 4) forage lichen value, as defined in the most recent version of Ministry of Environment's "Classification Guide for Terrestrial Lichen Habitat – Moe_ Omineca Region" (MOE, 2005). This document is located on the MOE Omineca Region Website: http://www.env.gov.bc.ca/omineca/esd/eco/eco_reports.html
 - identify for first pass, the spatial cluster of TLHs that capture the most decadent TLH, and/or the areas least resilient to forest health issues. Deal with forest health issues proactively. Become familiar with current plans, constraints and objectives of all licensees operating in a Low Elevation Winter Range Aggregate.
 - interstitial areas are to be managed on the same pass and rotation as the harvested clumps of TLH, regardless of their development status (age, operability, etc.). Therefore, what is not harvested in the first pass will not be available for harvest until the first pass of the next rotation (140 year rotation).
3. Within Low Elevation Winter Range Aggregate develop a pattern of disturbance (spatially and temporally) that minimized fragmentation by maintaining large continuous patches of mature forest, balanced by large continuous patches of regenerating forest, such that caribou have the ability to space out (away from early seral habitat that attracts predators). Patch size and seral stage targets for Laidman RMZ have been identified for a High Biodiversity Emphasis Option (BEO) Biodiversity Guidebook (Prov. BC, 1995), which gives biodiversity conservation a high management priority. Within the Caribou Management Strategy, which was 2001 Vanderhoof Forest District policy, (McAllister,2001) patch size targets were slightly modified from the High BEO option of the Biodiversity Guidebook to more closely represent the natural ecology found in the Laidman RMZ. More information on natural disturbance dynamics is now available; Delong's (2002) work on natural disturbance units of the Prince George Forest Region provides guidance for Sustainable Forest Management emphasizing Natural Range of Variability. Under this approach, Vanderhoof Forest District is part of the Moist Interior

natural disturbance unit, and has refined patch size distribution, block design, species composition, and structure associated targets. This direction should be applied at landscape in which the UWR are embedded.

Further to GWM 1.2

1. Strategies to create conditions to make unfavourable future conditions for wolf and snowmobile travel may include:
 - a. no ploughing of roads in the winter,
 - b. minimize the number of packed trails,
 - c. reclaiming or rehabilitating the road surface such that trees will grow on it again,
 - d. planting the road surfaces with suitable, fast growing species (such as aspen), that will inhibit movement in future years,
 - e. where access roads are needed for multiple-year harvest within UWRs, take steps to avoid non-industrial use between harvest entries.
2. Within all UWR except HE-3-001 (Naglico Hills area), do not sue snowmobiles or other motorized access from December 1 to May 1. The Caribou Management Strategy (McAllister, 2001), which has been adopted as Vanderhoof District Policy, outlines a general closure on snowmobiles from Dec 1 to May 1 for the area that corresponds to these UWRs (except for HE-3-001 Naglico Hills area).

To Maintain Food

Further to GWM 3.5

Note: Please see Nor 1 and Note 2 under the heading To Minimize Displacement regarding the relationship between GWM 3.7 and GWM 3.5 i).

1. It is the intent that on terrestrial lichen habitats, harvesting and silviculture activities should maintain or enhance pre-harvest lichen cover such that these sites will provide moderate (class 3) or high (Class 4) lichen values, as defined in the most recent version of Ministry of Environment's "Classification Guide for Terrestrial Lichen Habitat – MOE_ Omineca Region" (Moe, 2005). Website: http://www.env.gov.bc.ca/omineca/esd/eco/eco_reports.html
2. Within TLH's that are identified for first pass harvest (the non functioning half or portion of a Low Elevation Winter Range Aggregate), all harvesting and silviculture activities for these TLH need to be prescribed such that they ensure these sites will, 70 years post harvest, provide terrestrial lichen mats with medium (Class 3) or high (Class 4) forage lichen value. These TLH's then must contribute to support terrestrial lichen mats (Class 3 and 4) for the subsequent 70 years (70 to 140 years post harvest of the 140 year rotation), when temporally, the previously "non-functioning" half flips to become the "functioning" half of the Low Elevation Winter Range Aggregate.
3. Simultaneously, terrestrial lichen mats on terrestrial lichen habitats within TLH's that are identified as part of the "functioning" half or portion of a Low Elevation Winter Range Aggregate, should currently be and continue to be (until second pass harvest begins), in a successional stage that provides medium (Class 3) or high (Class 4) forage lichen value.

Further to GWM 3.6

1. Range practices that have the potential to cause the conversion of terrestrial lichen mats to forbe and moss cover include:
 - a. Mechanical damage to lichen mats from trampling
 - b. Mixing and fertilization resulting from the presence of livestock which could result in changes to the soil nutrient regime
2. Depending on site specific condition, strategies to consider include, but are not limited to:
 - a. Timing grazing use for a period when terrestrial lichen mats are not susceptible to trampling and/or soil are not susceptible to mixing
 - b. Minimize duration of grazing
 - c. Fencing cattle out of areas where there are terrestrial lichen mats

Further to all GWMs:

1. Within all UWR units, reflect UWR general wildlife measures in appropriate Fire Management Plans.
2. Conduct fire suppression activities that are required in a manner that does not result in a material adverse impact on the UWR habitat
3. Actions taken to put out fires in an UWR should minimize the impacts of fire to the UWR and its current state of management. Fire planners should be aware of which half or portion of the UWR is the “functioning” half (half left undisturbed to maintain caribou food availability) and the “non-functioning” half (half in which timber harvesting activities is occurring).
4. Target Low Elevation Winter Range Aggregates for high fire suppression priority, as a strategy to maintain terrestrial lichen availability in the short term. Suppressing fires is a short term strategy to maintain terrestrial lichen availability. However, to manage the maintenance of lichen across the landscape for the long-term, Ministry of Environment may change the objective to direction that allows fires to burn where there is not a significant risk to adjacent forest lands.
5. Within Low Elevation UWRs, where forest development is currently not viable or operational, consider the use of prescribed fire to achieve a sustainable supply of terrestrial lichen habitats. Use of prescribed fire must be done in a manner that simultaneously meets the guidance provided in the general wildlife measures related to access and forest harvesting, and should be consistent with approved fire management plans that incorporate measures to minimize impacts to caribou related to displacement, reduction of predation risks, and maintenance of food
6. Restrict fire suppression activities within high elevation UWRs where there is not a significant risk to adjacent forest lands.

