Appendix 5.4.11A
Caribou Species Account

PROJECT NAME: *Blackwater*

Scientific Name: *Rangifer tarandus caribou Pop. 1*
Species Code: M-RATA
Status:

All caribou in British Columbia (BC) belong to one subspecies of woodland caribou*, Rangifer tarandus caribou.* A previous assessment by COSEWIC in 2002 had used a subspecies classification as the primary means of delineation which was further divided into one of three ecotypes: Northern, Mountain, and Boreal (COSEWIC, 2004; Mountain Caribou Technical Advisory Committee, 2002) The distinction between the ecotypes was based on biogeography and habitat use rather than on any morphological differences (Nagorsen, 1990; Cowan and Guiget, 1965). The transition between the Northern and Mountain ecotypes was determined to occur between the Fraser River and Highway 97 in the Hart Ranges ecosection, and roughly corresponds to the northern limit of the Interior Cedar – Hemlock (ICH) biogeoclimatic zone in eastern BC (Simpson et al., 1997).

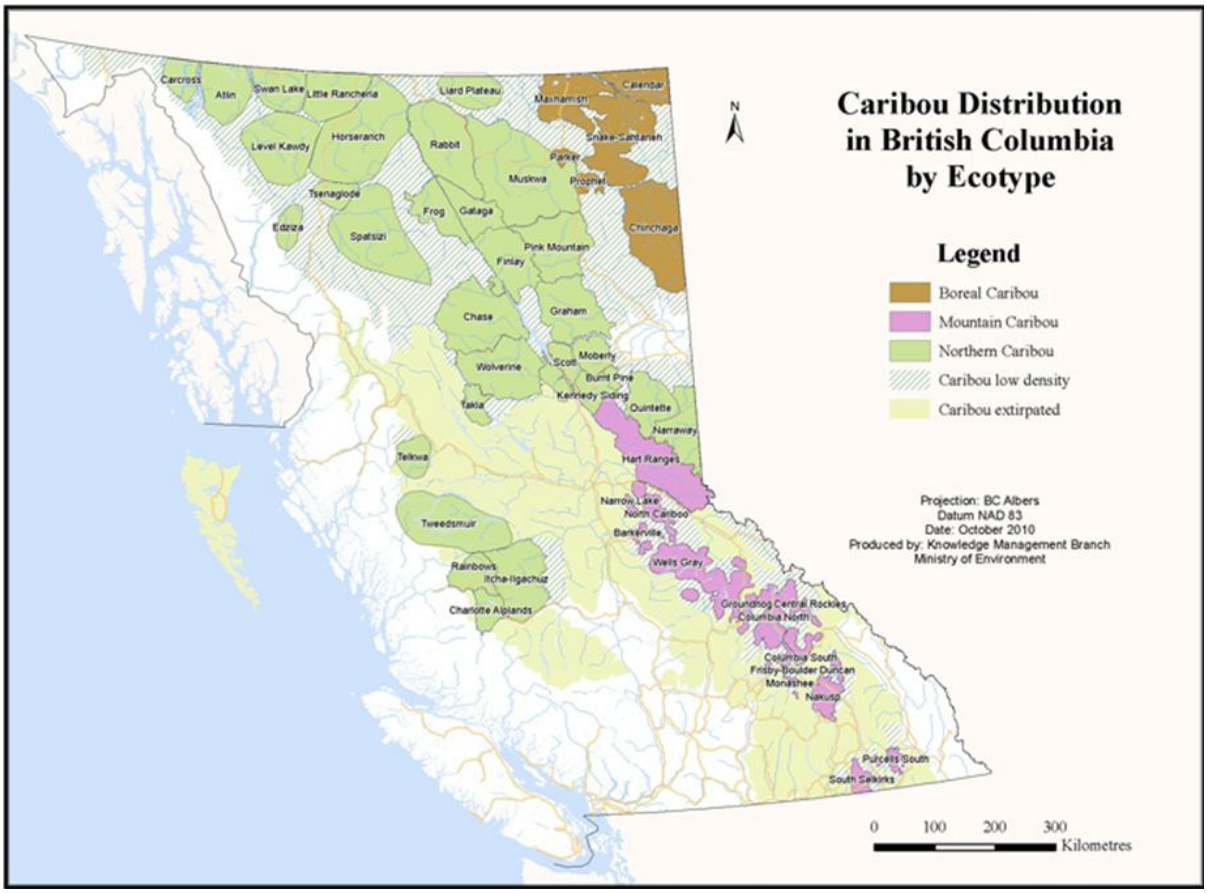
The Northern Mountain caribou population is Blue-listed in BC (BC CDC, 2014) and protected as big game under the BC *Wildlife Act* (1996). Woodland caribou (*Rangifer tarandus caribou*) of the Tweedsmuir-Entiako population are part of the Southern Mountain Population and designated as Threatened under Schedule 1 of *SARA* (COSEWIC, 2012).

In a 2011, in preparation for upcoming assessments and reassessments on caribou, a report by COSEWIC defined the Designatable Unit (DU) component as the new process of identifying populations of caribou in Canada. The DU concept acknowledges that there are spatially, ecologically or genetically discrete and evolutionarily significant units that are irreplaceable components of biodiversity (COSEWIC 2011). The Tweedsmuir-Entiako population and Itcha-Ilgachuz population are now considered part of the Northern Mountain Caribou DU7 (COSEWIC 2011).

- The Tweedsmuir-Entiako herd was thought to consist of approximately 500 animals (Cichowski and Banner, 1993), however the last survey in 2006 estimated that there were 250 animals in a range of 13,425 km^2 (BC Ministry of Environment (MOE), 2013). The herd typically spends the summer in high elevation areas, and migrates into forested lower elevations for the winter (Cichowski and Banner, 1993).

- The Itcha-Ilgachuz herd was last surveyed in 2010 where the population was estimated at a minimum count of 1,367 animals in a range of 9,457 km^2 (MOE, 2013).

1.0 DISTRIBUTION



Source: http://www.env.gov.bc.ca/wld/speciesconservation/caribou_by_ecotype.html

Provincial Range

The Northern Mountain DU inhabits areas with low to moderate snow depths in the boreal forests in the north and west-central portions of BC including the area of Tweedsmuir and Entiako Provincial Parks (Cichowski, 2010). In these areas, they forage primarily on terrestrial lichens but arboreal lichen use increases as winter progresses or during winters of deep snowpack (Bergerud, 1974a; Seip, 2002).

Provincial Context

The present distribution of caribou in Canada has changed from historical times (COSEWIC, 2011). Caribou are no longer found in Nova Scotia or New Brunswick and their distribution has been greatly reduced in southern Quebec and Ontario. Presently caribou inhabit most of the boreal forests of Canada and Alaska. In BC, caribou range has also been greatly reduced, particularly in the southern portion of the province and the Bulkley Valley-Prince George region (MOE, 1979). A provincial population estimate in 1996 estimated the population of caribou to be

between 14,000 to 17,000 animals (Seip and Cichowski, 1996) and data from surveys in the early-middle 2000s estimate the population to be at least 19,400 (MOE, 2013).

Elevational Range

- Mine Site LSA and RSA 852 to 1930 m
- Transmission Line LSA and RSA 671 to 1533 m
- Access Route LSA and RSA 694 m to 1518 m

Project Area:

Ecoprovince:	*Central Interior*
Ecoregion:	*Fraser Plateau*
Ecosections:	*Nazko Upland*
Biogeoclimatic Zones:	SBSdk, SBSdw3, SBSmc2, SBSmc3, ESSFmv1, ESSFmvp, BAFAun

Project Map Scale: *project specific*

2.0 ECOLOGY AND KEY HABITAT REQUIREMENTS

General

Caribou are primarily grazers, dependant on lichen-rich old-growth forests for winter forage. Northern caribou forage principally on terrestrial lichens but will also feed on arboreal lichens on both standing and windblown trees, as well as on litterfall, grasses, sedges, forbs, leaves of willow and dwarf birch, mosses, and fungi. In spring and summer, caribou feed on variety of shrubs, forbs, and graminoids, which are relatively high in protein at this time of year. Lichens may be eaten during these seasons but are not preferred (Bergerud, 1972; Rominger and Oldemeyer, 1990).

Lichens are low in protein but high in digestible carbohydrates and become particularly important to caribou in winter, when they are the only forage that is abundantly available. However, a winter diet of only lichens can retard digestive processes in the rumen and lead to loss of condition (Russell and Martell, 1984). In early winter, access to non-lichen forage supplements such as evergreen shrubs would be advantageous, especially to pregnant cows, and might delay the potential detrimental effects of a restricted diet in late winter (Russell and Martell, 1984, Rominger and Oldemeyer, 1990).

Snow depth and density can affect the availability of caribou winter forage. Deep snow may prevent cratering for terrestrial lichens, while crusted snow may provide a platform on which to reach arboreal lichens. Yearly variations in snow depth and density may be reflected by changes in patterns of caribou winter range use (Edmonds and Bloomfield, 1984; Russell and Martell, 1984; Hatler, 1986; Wood, 1994).

Caribou can detect lichens through 15 cm to 18 cm of undisturbed snow cover (Bergerud and Nolan, 1970), but use air vents adjacent to emergent stems of tall shrubs to detect lichens at depths of at least 72 cm (Bergerud, 1974a; Helle, 1981). The critical snow depth for cratering for a solitary forest caribou is 65 cm to 74 cm (Bergerud, 1974b; Helle, 1981), while a herd can crater in 80 cm to 90 cm of snow, provided that the sinking depth is less than 70 cm (Nasimovich, 1955; Helle, 1981). However, deep, soft snow can temporarily immobilize caribou and restrict them to small pockets of range (Bergerud, 1974b).

Cichowski (1993) reported that caribou of the Itcha-Ilgachuz herd in some years would forage extensively during fall in Fescue-Lichen meadows, Altai fescue-Cladonia dry grassland and Timber oatgrass-Altai fescue cold dry meadow but abandoned them in favour of lichen-forests when snow depths approached 50 cm with caribou sinking depths of 40 cm.

Northern caribou display two different habitat use strategies during winter. A minority of the population winter in the mature/old-growth forests of the Engelmann Spruce – Subalpine Fir (ESSF) biogeoclimatic zone and on the open, windswept alpine habitats with reduced snow accumulation giving access to terrestrial lichens by cratering. The majority of caribou winter at lower elevations in the extensive lodgepole pine-dominated, mature/old-growth forests of the Montane Spruce (MS) and Sub-Boreal Pine – Spruce (SBPS) zones where terrestrial lichens are most abundant (Young and Loveridge, 1996). During winter, the Tweedsmuir-Entiako caribou use mostly mountain pine beetle (MPB)-killed pine stands and mixed MPB-killed/live pine stands at low elevations and selected Caribou Habitat Types with abundant terrestrial lichens: Dry Lichen/Lichen Moss (DLLM) in early and mid winter; and Lichen Moss (LM) in late winter (Cichowski, 2010).

Arboreal lichens are also of great importance to caribou survival, especially in late winter when snow pack makes cratering for terrestrial lichens difficult. Caribou may shift to feeding on arboreal lichens when snow depths exceed 80 cm and density and hardness are sufficient for support (Nasimovich, 1955). While arboreal lichens occur in all coniferous forests they are most abundant in the more moist forest types, particularly on trees in forested wetlands and on the margins of wetlands and lakes in the ESSF zone (Edwards et al., 1960; Antifeau, 1987; Cichowski, 1996). Caribou selected trees with higher biomass of lichen than was randomly available along the movement paths studied (Johnson et al., 2004).

Preferred Forage Species

Caribou eat a wide variety of plant species including graminoids, forbs, mosses, fungi, shrubs, and lichens. Consumption of conifers is believed to be incidental (Rominger and Oldemeyer, 1990; Cichowski pers. comm., 1998). Bergerud (1972) reported caribou food preferences were for greens in the growing season, fungi in summer and fall, and lichens in fall. Lichens become increasingly important in winter due to their abundance, accessibility, and high digestibility provided sufficient nitrogen is available in the rumen (Thomas and Kroeger, 1981; Thomas et al., 1984). They are able to digest lichens and survive on a low protein diet by recycling urea (Parker et al., 2005).

Terrestrial lichens are the winter forage species of most importance to northern caribou. In descending order of preference, the lichen species eaten most often are *Cladina* spp., *Cladonia* spp. and *Stereocaulon* spp. Preferred lichen species include *Cladina mitis*, *C. rangiferina, C. arbuscula spp. beringiana, Cladoina uncialis, C. ecmocyna*, and *Bryoria* spp. (Anonymous, 2000; Johnson et al., 2000). *Stereocaulon* spp. is also a preferred or at least secondary preferred species of lichen by caribou (Cichowski et al., 2001). *Peltigera* species, although often abundant, are not selected by caribou (Bergerud, 1972; Holleman and Luick, 1977). The most preferred terrestrial lichen species do not become established and abundant in forested areas until up to 50 years after site disturbance (Ahti, 1977; Cichowski, 1993).

The arboreal lichens of most importance to caribou, particularly in late winter, are *Bryoria* spp., and *Alectoria* spp. The low protein content of lichens is offset by their high digestibility by caribou (Cooperrider et al., 1980; Thomas et al., 1984). Arboreal lichens reach their highest abundance on trees of age classes 7 to 9 (121 to 251+ years) (Edwards et al., 1960). Table 1 lists important forage species for northern caribou.

Table 1. Important Forage Species for Northern Caribou

Terrestrial Lichens	*Cladina* spp. *Cladonia* spp. *Stereocaulon* spp.	
Arboreal Lichens	*Bryoria* spp. *Alectoria* spp. *Cetraria* spp.	
Shrubs	Willow *Salix* spp. Birch *Betula* spp. Labrador tea *Ledum* spp. *Vaccinium* spp.	Saskatoon *Amelanchier alnifolia* Alder *Alnus* spp. Crowberry *Empetum nigrum* Bog-laurel *Kalmia* spp.
Trees	Subalpine fir *Abies lasiocarpa*	
Graminoids	Bluegrasses *Poa* spp. Altai Fescue *Festuca altaica* Fescues *Festuca* spp. Wheatgrasses *Agropyron* spp. *Bromus* spp.	Sedges *Carex* spp. Bulrush *Scirpus* spp. Rushes *Juncus* spp.
Forbs	Lupine *Lupinus spp.* Indian paintbrush *Castilleja spp.* Pussytoes *Antennaria spp.* *Eriogonum spp.* Cinquefoil *Potentilla spp.* Bracted lousewort *Pedicullaris bracteosa* Northern bedstraw *Galium boreale* Fireweed *Epilobium spp.* *Anemone spp.*	Horsetail *Equisetum* spp. Foamflower *Tiarella* spp. Mitrewort *Mitella* spp. Solomon's seal *Smilacina* spp. Bunchberry *Cornus canadensis* Sitka burnet *Sanguisorba canadensis*

Terrestrial Lichens	*Cladina* spp. *Cladonia* spp. *Stereocaulon* spp.	
	Aster *spp.* Yarrow *Achillae spp.*	
Other Forage	Mushrooms Mosses	

Source: Himmer and Power, 1999

Reproduction

The areas suitable for fall rutting are those that provide caribou with a relatively unobstructed line-of-site to facilitate group interactions (Fenger et al., 1986).

To reduce predation levels on calves during parturition, northern caribou disperse widely throughout rugged, exposed terrain above the treeline. Many caribou calve at higher elevations in alpine or subalpine habitat (Yaremko and Sulyma, 2005); however, in the northern portion of Tweedsmuir Park only 30% of the breeding caribou were found above the treeline and 50% were found at low elevations (Cichowski, 1993). They also use this dispersal strategy in forested habitats (Bergerud et al., 1984; Hatler, 1986; Cichowski, 1993). However, calf survival rates have been found to be higher in rugged, mountainous terrain where the cows and calves can distance themselves from other prey species and predators (Seip and Cichowski, 1996). Habitats were not rated separately for rutting or calving.

Territory/Home Range

Caribou are non-territorial except during the rut. The home range of an animal must provide all the specie's life requisites for all seasons throughout the life of the animal. Therefore, species' home range size in a particular area will depend on the degree to which all its requisites are provided for. Summer and winter ranges of caribou are often separate and distinct areas linked by migration corridors. Lance and Mills (1996) described the physical and botanical characteristics of spring migration habitats for the Tweedsmuir-Entiako caribou herd. All habitats were characterized by having raised and open aspects, sparse tree cover, free-draining soils, and a simple flora with abundant terrestrial lichens.

While most caribou range within a discrete area during each winter, they may not return to the same area the following year.

The sizes of annual home ranges of collared caribou cows in the both the Itcha-Ilgachuz herd and that of the Rainbow Range have varied greatly. Over a 24-month monitoring period, the Itcha-Ilgachuz caribou ranged from 597 km^2 to 4,475 km^2 with an average home range size of 2,720 km^2 (n=15). Home ranges for Rainbow caribou varied from 1,568 km^2 to 2,485 km^2 with an average range of 1,945 km^2 (n=5) (Young and Shaw, 1998a,b). Summer home ranges varied from 4.8 km^2 to 731.4 km^2 in the Tweedsmuir-Entiako area, and from 3.5 km^2 to 554.8 km^2 in the Itcha-Ilgachuz – Rainbow area (Cichowski, 1993).

Cichowski (2010) found that seasonal movements, range use and habitat use from 2006/07 to 2008/09 during the MPB-Grey attack stage and determined that they were similar to seasonal movements, range use and habitat use prior to the MPB epidemic.

Caribou select a wider range of cover types when travelling between habitat patches (Inter-movement): pine lichen woodland, rocky alpine ridges and slopes; lakes and rivers, grassy alpine ridges, and hybrid spruce stands (Johnson et al., 2002). These habitats are often across valley bottoms within relatively high exposure to risk. The animals choose flat areas with little elevation change to achieve a relatively low energetic cost of movement (Johnson et al., 2004).

When caribou travel within adjacent habitat patches (intra-patch) they demonstrate a strong selection for pine-lichen woodland and rocky alpine ridges and slopes, followed by patches of black spruce and mixed stands of black spruce and pine (Johnson et al., 2002).

3.0 HABITAT USE – LIFE REQUISITES

Habitats for caribou were rated separately for two seasons: Winter and Growing (an amalgamation of spring, summer and fall seasons). The life requisites rated were Feeding (FD), Security (SH), and Thermal (TH) habitats for the specified season.

Feeding Habitat (FD)

In winter, the majority of northern caribou forage predominantly on terrestrial lichens in the low elevation lodgepole pine-dominated, mature/old-growth forests of the SBPS and MS zones (the latter zone does not occur in the study area). In early winter (December to March), both immature and mature stands of dry, terrestrial lichen dominated stands are used extensively and by late winter and early spring (mid-March to April) caribou have started to use moist forested sites in addition to dry lichen sites (Cichowski, 1993) For northern caribou, structural stage 7 is consistently preferred throughout most of the year. Structural stage 6 also provides useful habitat, particularly the older and more open end of the stage. Northern caribou may forage in structural stage 5, where, in some areas and ecosystems, forage (terrestrial lichens) may be abundant (Cichowski et al., 2004).

Johnson et al. (2004) did not find that caribou actively selected for large patches of pine-lichen woodland and observed caribou using patches that ranged from 0.063 ha to 359 ha. Data suggest that during winter small patches of pine-lichen woodland are of value during their wide-ranging movements (Johnson et al., 2004). Feeding sites selected by caribou had as little as 19% cover of lichen (Johnson et al., 2004).

As snowpack deepens in late winter, caribou increase their use of arboreal lichens. A minority of the caribou population winter on windswept subalpine and alpine slopes where they feed mainly on terrestrial lichens supplemented by arboreal lichens on trees near the treeline.

In late winter, when increased snow depths make cratering for terrestrial lichens difficult, caribou will feed increasingly on arboreal lichens. While arboreal lichens occur in all coniferous forests, they are most abundant in ESSF forests. Caribou cratered most frequently in pine and pine/spruce stands and foraged for arboreal lichens in all stand types (Cichowski, 2010). In

addition to traditional terrestrial lichen craters, caribou also cratered in spruce stands at the base of trees for horsetails. They also cratered at the base of MPB-Grey attacked trees, possibly for mushrooms associated with tree decay.

Studies suggest that caribou actively select patch mosaics of pine-lichen woodland, wetlands and patches of black spruce during winter (Terry and Wood, 1999; Johnson et al., 2004). Wetlands and black spruce stands support sedges, which caribou may eat to balance a winter diet otherwise dominated by high-energy, low-protein terrestrial lichens (Storeheirer et al., 2002).

Caribou have a much more varied diet in spring, summer, and fall when, in addition to lichens, they will feed on a variety of graminoids, forbs, shrubs, mosses, and fungi in forests, wetlands, subalpine parkland, and alpine tundra.

Security Habitat (SH)

To avoid contact with predators, caribou use security habitat, where, if threatened, they can escape by fleeing. Rugged, exposed alpine/subalpine terrain provides caribou with the best security habitat where they can distance themselves from other prey species and best detect and avoid predators (Poole et al., 2000). Predation risk is greatest for caribou travelling between habitat patches, lowest in alpine habitat and no apparent influence on intra-patch movements (Johnson et al., 2004).

Seip (1992a) attributed major declines in caribou populations of central BC to increases in numbers of moose in the 1920s. The presence of moose supports increased wolf numbers and results in higher predation levels on caribou (Seip, 1992a; Seip and Cichowski, 1996). James et al., (2004) found that caribou select habitat that is less suitable for moose, resulting in a spatial separation away from wolves. Although grizzly bears, black bears, lynx, and wolverines are known to prey on caribou, wolves are believed to be their main predator through most of their range (Bergerud and Elliot, 1986; Seip, 1992a). However, in a study in northern BC, Gustine et al. (2006) found that wolverine is the primary predator of caribou calves up to two weeks of age. Caribou are particularly susceptible to predation as they have slow reproductive rates compared to other ungulates. While moose cows can breed at 1.5 years of age, produce twins and sometimes triplets, caribou do not breed until they are at least 2.5 years and give birth to a single calf.

Rugged, exposed alpine/subalpine terrain provides caribou with the best security habitat where they can distance themselves from other prey species and best detect and avoid predators (Poole et al., 2000).

Caribou make most use of forests in winter. When caribou use forested habitats they compromise security for foraging needs (Seip and Cichowski, 1994; Bergerud, 1996). Unlike other cervids, such as moose which prefer to hide in dense forest cover, caribou use large frozen lakes and wetlands adjacent to forest stands as escape terrain, as caribou are better adapted to travel through deep snow than their predators (Calef, 1981; Higgelke and MacLeod, 2000).

In both forested and non-forested habitats, caribou need large tracts of land through which they can disperse to reduce predation levels (Environment Canada, 2012; Mountain Caribou Technical

Advisory Committee, 2002). This dispersal strategy is particularly important during, and immediately after, parturition as calves are the most vulnerable to predation (Bergerud et al., 1984).

Thermal Habitat (TH)

Thermal habitat is used by caribou to assist them in maintaining a constant body temperature. In summer, most caribou are in subalpine/alpine habitats where they can find relief from solar heat by using forest shade, lingering snowfields, or cool windswept alpine slopes. Caribou are highly adapted, both physiologically and behaviourally, to life in arctic and subarctic winters and show no thermal cover dependency (Edmonds and Bloomfield, 1984). They are relatively insensitive to all but the most severe winter conditions. Russell and Martell (1984) reviewed the literature on caribou winter activity: caribou will forage at temperatures as low as -50° C (Henshaw, 1968), although activity may be reduced below -35° C (Roby, 1978). Moderate wind speeds (less than 15 km/hr) have little effect on behaviour, but caribou movement increases as the animals begin to lose body heat due to increasingly greater wind speeds (Thomson, 1977). In high winds (greater than 30-40 km/hr) and in blizzard conditions, caribou will aggregate and eventually bed down to conserve heat (Henshaw, 1968; Baskin, 1970; Thomson, 1977). Winter thermal habitat is provided by mature/old-growth forest, tree-islands in subalpine parkland, krummholz, lee-slopes, and broken terrain that give shelter from chilling winds.

Summer and winter ranges of caribou are often separate and distinct areas linked by migration corridors. While most caribou range within a discrete area during each winter, they may not return to the same area the following year.

4.0 SEASON OF USE

The thermal, security, and feeding habitat requirements of caribou vary with the seasons. Table 2 summarizes the life requisites for northern caribou during the year.

Table 2. Monthly Life Requisites for Northern Caribou

Month	Season*	Life Requisites
January	Winter	Feeding/Security and Thermal
February	Winter	Feeding/Security and Thermal
March	Winter	Feeding/Security and Thermal
April	Early Spring	Feeding/Security and Thermal
May	Late Spring	Parturition /Feeding/Security and Thermal
June	Summer	Parturition /Feeding/Security and Thermal
July	Summer	Feeding/Security and Thermal
August	Summer	Feeding/Security and Thermal
September	Fall	Feeding/Security and Thermal
October	Fall	Rutting/Feeding, Security and Thermal
November	Winter	Rutting/Feeding, Security and Thermal
December	Winter	Feeding/Security and Thermal

Note: Seasons defined for Central Interior Ecoprovince as per the Chart of Seasons by Ecoprovince (RISC, 1999, Appendix B).

Winter Season (November to April) - Caribou have specific feeding requirements during the winter season. They depend on the availability of abundant terrestrial and arboreal lichens.

Spring Season (April to May) - At the time of spring parturition (May to June), caribou cows and calves are particularly vulnerable to predation. During this season they require isolation and concealment from predators. Pregnant cows will disperse throughout either rugged subalpine/alpine terrain or forested habitats.

Summer/Fall Season (June to October) - In the growing season caribou require feeding and security habitat, taking advantage of plant phenology and food availability.

5.0 HABITAT USE AND ECOSYSTEM ATTRIBUTES

Table 3 outlines how each life requisite relates to specific ecosystem attributes (e.g., site series/ecosystem unit, plant species, canopy closure, age structure, slope, aspect, terrain characteristics).

Table 3. Relationship between Terrestrial Ecosystem Mapping (TEM) Attributes and the Life Requisite for Northern Caribou

Life Requisite	TEM Attribute
Feeding Habitat	• Site: site disturbance, elevation, slope, aspect, and structural stage • Soil/Terrain: bedrock, terrain texture, flooding regime • Vegetation: % cover by layer, species list by layer, cover for each species for each layer
Security Habitat	• Site: elevation, slope, aspect, structural stage • Soil/Terrain: terrain texture • Vegetation:% cover by layer • Mensuration: tree species, dbh, height
Thermal Habitat	• Site: elevation, slope, aspect, structural stage • Soil/Terrain: terrain texture • Vegetation: % cover by layer • Mensuration: tree species, dbh, height

6.0 RATINGS

There is a detailed level of knowledge of the habitat requirements of northern caribou in BC and therefore, a 6-class rating scheme is used.

Table 4. Habitat Suitability 6-Class Rating Scheme used for Caribou

% of Provincial Best	Rating	Code
100% - 76%	High	1
75% - 51%	Moderately High	2
50% - 26%	Moderate	3
25% - 6%	Low	4
5% - 1%	Very Low	5
0%	Nil	6

Habitat Suitability Ratings

Habitat Suitability is defined as the ability of the habitat in its current condition, to provide the life requisites of a species (RISC Habitat Rating Standards, 1999). In assigning a suitability rating for caribou to a particular habitat, that habitat is assessed for its potential to support the species for a specified season and life requisite compared to the best habitat in the province (i.e., the provincial benchmark) for the same season and life requisite. Each biogeoclimatic zone, site series, and structural stage (stages 1-7) is evaluated and assigned a Suitability Rating Class based on its ability to provide the life requisites for caribou for winter and growing seasons.

Provincial Benchmark

Ecoprovince:	Northern Boreal Mountains
Ecosection:	Stikine Plateau (STP)
Biogeoclimatic Zones:	SWBun/AT
Broad Ecosystem Unit:	Lodgepole Pine / AG-Alpine Grassland (Winter); Alpine Meadows (Growing)
Winter Habitats:	Mature/old-growth mesic forests with terrestrial and arboreal lichens; subalpine parkland and alpine tundra with terrestrial lichens
Growing Habitats:	Wetter forest types, sedge meadows with graminoids, forbs, and deciduous shrubs; subalpine parkland and alpine tundra

Ratings Assumptions

- Immature forests (age classes 1-4, < 80 years; seral stages 1-5) have minimal feeding or security habitat values for all seasons (suitability $\leq$ 5).
- Mature/old-growth ESSF, MS, and SBPS forests (age classes 8 and 9; structural stages 6 and 7), have high values (suitability $\leq$ 1) for feeding and moderate to low values (suitability $\leq$ 3) for security.
- Mature/old-growth ESSF forests have the highest late winter feeding values (suitability $\leq$ 1) for arboreal lichens, particularly on wetter sites. Windswept Alpine Tundra ridges and gentle to moderate slopes with access to terrestrial lichens have high feeding and security values (suitability $\leq$ 2) for winter, and moderate to low feeding value (suitability $\leq$ 3) for the growing season.
- Mid to upper slopes of the ESSFxv1 with high terrestrial lichen cover and lichen-bearing trees (classes 3-5 *Bryoria, Alectoria*) have high feeding value (suitability $\leq$ 1) for winter. Moist forest habitats (Moss/Seepage Forest; Wetland/Wetland Forest units) have moderately high (suitability $\leq$ 2) feeding values in spring.
- Steep, rugged, exposed terrain above treeline (e.g., subalpine rock outcrops with krummholz) has high values (suitability $\leq$ 1) for calving habitat.
- Fescue-Lichen meadows (Habitat unit: TF**-**Timber oatgrass-Altai fescue cold dry meadow) provide moderate value (suitability 3) feeding habitat in the growing season, particularly in fall, but are rarely used in late winter (suitability $\geq$ 5) due to deep snow.

7.0 RATINGS ADJUSTMENTS

Final habitat suitability map products incorporate: 1) landscape heterogeneity and connectivity; 2) habitats adjacent to significant anthropogenic disturbance regimes (e.g., roads, settlements); and 3) interspersion of different structural stages within the landscape 4) Results from caribou forage lichen surveys 5) the presence of lakes and wetlands in the ESSF and BAFA BGC zones. Adjustments typically increase or decrease suitability value by a single class.

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TWEEDSMUIR-ENTIAKO CARIBOU

Fall 2013 Calf Survival Flight

Prepared for: Ulkatcho First Nations
New Gold Inc.

Prepared by: Deborah Cichowski
Caribou Ecological Consulting

Date: October 27, 2013

Observers: Deborah Cichowski, Caribou Ecological Consulting, Smithers, BC.
Tom Smith, Smithers, BC.
Conrad Thiessen, Ministry of Forests, Lands and Natural Resource Operations, Smithers, BC.

Aircraft Company: Canadian Helicopters, Bell 206, Tom Brooks, pilot

Objective: To determine fall calf survival for the Tweedsmuir---Entiako caribou population based on caribou seen in rutting aggregations in the Quanchus Mountains.

Weather: Morning: -4 to 0℃; overcast with ceiling at about 6,000 ft
Afternoon: 0℃; sunny/broken overcast

Methods:

A Bell 206 helicopter was used to search alpine areas and subalpine meadows/wetlands in the four alpine blocks in the Quanchus Mountains: Mt. Wells/Tweedsmuir Peak; Michel Peak; Wells Gray Peak; and, Eutsuk Peak. Each group of caribou was counted and classified as bulls, cows, and calves. Other species of wildlife were also recorded. In addition, we also listened for frequencies of 12 radio---collared caribou from a study that ended in March 2009 during the survey to opportunistically assess how many were still alive and functioning.

Results and Discussion:

Cloud cover at the beginning of the survey prevented searches of higher elevation portions of the survey area in the Mt. Wells/Tweedsmuir Peak and Michel Peak blocks. However, by the end of the survey, the cloud layer lifted and we were able to survey the remaining portions of those blocks.

A total of 94 caribou were counted in five groups in the Quanchus Mountains (Table 1). All caribou were found in the Mt. Wells/Tweedsmuir Peak and Wells Gray Peak mountain blocks. Fall calf survival was 10.6% calves and 16.7 calves/100 cows. The bull cow ratio was 40 bulls/100 cows.

Table 1. Caribou counted during a survey of the Quanchus Mountains in northern Tweedsmuir Park, 27 October 2013.

Survey Block	Tota	#	#	#	Comments
Mt. Wells/ Tweedsmuir Peak	37	8	25	4	One cow with two yellow ear tags
	3	3			
Michel Peak	0				
Wells Gray Peak	12	4	8		
	1	1			
	41	8	27	6	Includes collar 148.730
Eutsuk Peak	0				
Total	94	24	60	10	

Nine of the 12 caribou that had functioning collars (VHF) at the end of March 2009 were contacted during the flight. Five of those nine were on mortality mode and four were still alive. One of the four caribou (148.730) was seen in a group of 41 caribou in the Wells Gray Peak area. Signals from the other three radio---collars on live caribou indicated that those caribou were in the area west of the Quanchus Range. Of the three radio collars not contacted during the flight, one was collared in 2000 so that collar had likely stopped functioning; the other two were both collared in January 2007 and both were found alive during a survey in March 2012. Although the two caribou were not heard during the flight, they may have been out of detection range and could potentially still be alive.

Other wildlife observed during the survey included:

- 2 moose (2 bulls)
- 15 mountain goats (1 adult male, 14 unidentified adults)
- 7 grizzly bears (1 unidentified adults, 2 sows, 4 cubs)
- 6 wolves (4 black, 2 grey)

Itcha-Ilgachuz Seasonal Caribou Calf Survival Inventory

Date: 25 October 2013

Personnel: T. Arduini – Arduini Helicopters
Dr. D. Hebert
D. Lay
Becky Cadsand

Weather: Clear / Perfect
Unlimited visibility
Skiff of snow on the Mtn tops
Temp. 10° - 12° C

Flight Time: 10:30 am – 3:30 pm (approx)

This flight was a continuation of the calf survival flight conducted in 2012. Conditions were ideal. Radio signals were assessed to determine which radios were still active.

The Itcha-Ilgachuz caribou population has declined approximately 52% between 2003 and 2010. Although there are a range of cumulative effects, the precise cause is unclear.

Mining, logging, roads, mountain pine beetle, and fire may reduce habitat quality and quantity through the medium and long term, while wolf predation may act through the short and medium term. Cause and effect changes through habitat supply are more difficult to assess, while population changes through wolf predation may be more obvious.

Objectives

The purpose of the present survey was to assess population parameters and change between years 2012 and 2013, through the calf component. In the past few years, few seasonal calf indices have been obtained.

Survey

The survey was conducted using two observers and one pilot/observer and one person checking radio collar signals, between 10:30 am and 3:30 pm (approximately).

During the 2013 survey, there were no animals at high elevation. All animals were at mid elevation on gentle slopes or in mid to upper elevation meadows and creek bottoms.

According to the Ministry of Environment caribou survey reports, the Itcha-Ilgachuz caribou population has declined approximately 52% between 2003 and 2010. During that time, the June age ratio has remained relatively stable ranging between 42 and 55 calves/100 cows. This might suggest that carrying capacity and habitat have remained consistent. Similarly, the bull/cow ratio has remained relatively stable and both ratios suggest adequate to good reproductive success. However, there have been few seasonal surveys to assess either sex or age ratio changes.

The yearling to adult female ratio conducted during the June surveys (yearlings are difficult to identify at 1 year of age) (2003, 2009, and 2010) indicates a potential decline in annual survival (9 yrl/100 cows, 5.17 yrl/100 cows and 3.9 yrl/100 cows).

This year, although yearlings were not specifically counted, to reduce the level of harassment, there were only, about 6 yearlings observed (0.9 yrl/100 cows)

The survey obtained a sample of 616 caribou, which resulted in an age ratio of 3.36 ca/100 cows (Table 1). In order to maintain the Itcha-Ilgachuz caribou population, the age ratio at 1 year of age should be approximately 10 to 15 calves (yrl)/100 cows. Combining the October 2012 fall ratio with the previous recruitment ratios of 2003 – 2012, would suggest that the population is continuing to decline rapidly. Based on an age ratio of 3.36 ca/100 cows in October, the recruitment rate in March to June will likely drop to 0 yrl/100 cows.

Table 1. Caribou Population Ratio Survey – 25 October 2013

Area	Cows	Calves	Bulls	Totals
Itcha Flats	107	3	5	115
Itcha N. Mts.	141	5	14	160
Itcha NW	14	1	5	20
TOTALS	**262**	**9**	**24**	**295**
Ilgachuz Flats Between the Ithcha & Ilgachuz Mts.	42	1	3	46
Itchas	232	8	35	275
TOTALS	**274**	**9**	**38**	**321**
TOTAL (ALL AREAS)	**536**	**18**	**62**	**616**

18/536 = 3.36 Calves/100 Cows
62/536 = 11.7 Bulls/100 Cows
18/598 = 3% Calves in total population

The cow/calf ratio declined significantly between 2012 and 2013, from 13.2 ca/100 cows to 3.36 ca/100 cows. It also appears that recruitment is continuing to decline. The spatial distribution of caribou was also significantly different between years. Whereas there were only 88 caribou observed in the Itcha mountains in 2012 and 298 observed in the Ilgachuz mountains, there were 614 seen in the Itcha mountains in 2013, and only 2 in the Ilgachuz mountains. There were a few caribou using the flats and meadows between the two mountain ranges and these animals may have come from the Ilgachuz range.

The bull/cow ratio is a bit low, but relatively consistent between years.

Although more surveys and/or more research could aid in the assessment of cause and effect, it is hard to imagine that the population could survive the exercise. It is imperative that a wolf predation assessment program be initiated immediately. It is possible and highly likely that wolf

predation could reduce the caribou population and allow the remaining cumulative effects (mining, logging, roads, fire, mountain pine beetle) to curtail the opportunity for recovery.

Similarly, unless the SARA recovery plan and action plan are completed within the next year, and action undertaken, it is unlikely that this population will be given an opportunity to recover.

Associated Observations

Although mountain goats were not specifically counted, to minimize harassment levels, the number of kids/100 females was considerably higher than that for the caribou population. Most mountain goats were on gentle terrain, at variable distances from escape terrain.

As well, the game trails throughout the Ilgachuz appeared to have little relative use, compared to past years. The temporal/monthly pattern of use throughout this range is unknown.