Appendix 5.4.12A
Grizzly Bear Species Account

Project Name: Blackwater
Scientific Name: *Ursus arctos*
Species Code: M_URAR
Status: Blue-listed by the British Columbia Conservation Data Centre; designated as Special Concern by Committee on the Status of Endangered Wildlife in Canada (COSEWIC); not listed under *SARA*.

1.0 DISTRIBUTION

Provincial Range

Grizzly bears inhabit all forested and non-forested regions of British Columbia, with the exception of Vancouver Island, Haida Gwaii, and outer coastal islands. They can be found within all biogeoclimatic zones, except the Coastal Douglas Fir zone and occupy a wide variety of habitats ranging from coastal estuaries to alpine meadows (Cowan and Guiguet, 1965; Hatler, 2008).

Elevational Range

Sea-level to alpine.

Provincial Context

The grizzly bear has been extirpated from most of the southern and eastern portions of its original continental range. British Columbia is recognized as the centre of viable grizzly bear populations in the southern half of the species current range (Hatler et al., 2008).

In 2012, the population of grizzly bears in British Columbia was estimated to be approximately 15,000 animals (British Columbia Ministry of Forests, Lands and Natural Resource Operations, 2012).

Project Area

Ecoprovince:	Central Interior
Ecoregions:	Fraser Plateau
Ecosections:	Nazko Upland (NU)
Biogeoclimatic Zones:	Sub-Boreal Spruce Dry Cool (SBSdk) Sub-Boreal Spruce Stuart Dry Warm (SBSdw3) Sub-Boreal Spruce Babine Moist Cold (SBSmc2) Sub-Boreal Spruce Kluskus Moist Cool (SBSmc3) Engelmann Spruce — Subalpine Fir Nechako Moist Very Cold (ESSFmv1) Engelmann Spruce — Subalpine Fir Moist Very Cold Parkland (ESSFmvp) Boreal Altai Fescue Alpine Undifferentiated (BAFAun)
Elevation Range in Study Area:	671 metres above sea level (masl) to 1,930 masl

2.0 ECOLOGY AND KEY HABITAT REQUIREMENTS

General

Habitat use by grizzly bears and home range size is influenced primarily by food availability, the presence of suitable resting and denning sites, the presence of other bears, and by human development (Macey, 1979). Home ranges typically encompass separate seasonal habitats, and travel routes between and within the different habitat types are a necessary requirement for continued use (Jonkel, 1987). Travel corridors are also important for young grizzly bears as habitats, where they may live and gradually disperse through over a period of one to four years (COSEWIC, 2002). Migrating grizzly bears will use travel corridors such as game trails, human trails, shorelines, ridges, creek beds, avalanche chutes, logging roads, sandbars, and river banks.

3.0 HABITAT USE – LIFE REQUISITES

Changes in social status, food availability, population, interactions with humans, and natural disturbance can all affect grizzly bear use of a particular habitat (Mahon et al., 2004). The life requisites that were rated for grizzly bear are feeding, security, and thermal habitat, which are described in detail below.

Feeding Habitat (FD)

Grizzly bears are omnivorous and opportunistic in their feeding habits consuming a great variety of items. Their foraging strategies are somewhat flexible, with individuals adapting to annual variation in food supply and exploitation of newly available food sources (Gyug et al., 2004). Some grizzly bears will use the same areas as others but feed on different foods (MacHutchon et al., 1993; Simpson, 1990; Zager and Jonkel, 1983). They eat primarily vegetation through most of the year, and their habitat associations are therefore strongly seasonal and typically reflect local plant phenology. In mountainous regions, this may result in seasonal elevational migrations (COSEWIC, 2002). Based on a chemical analysis of grizzly hair, Hobson et al. (2000) calculated that plants comprised 91% of grizzly bear diet in southeastern BC. Grizzly bears usually return to the same seasonal food sources and areas throughout their lifetime (Gyug et al., 2004).

While vegetation forms the bulk of grizzly bear diet, especially in late spring and early summer, they also feed on insects, fruits, berries, fish, carrion, and small and large mammals (Craighead and Mitchell, 1982; McNamee, 1986; Stevens and Lofts, 1988; Fuhr and Demarchi, 1990). In early spring, after emerging from their winter dens, grizzly bears require high protein, digestible forage and feed on ungulate carcasses, ungulate calves/fawns, early emergent and succulent vegetation in wet meadows, riparian areas, seepage sites, swamps, avalanche chutes, and burns. As snowmelt proceeds upslope, bears ascend to follow the emergence of fresh vegetation (COSEWIC, 2002). The lusher sites are often located on southwest aspects (Simpson, 1987).

Grasses, sedges, horsetails and overwintering berries (e.g., crowberries (*Empetrum nigrum*) and kinnikinnick (*Arctostaphylos uva-ursi*)) are the most commonly selected spring food items of bears, mainly because these plants are available early in the year. Grizzly bears will also strip

bark from conifers such as subalpine fir (*Abies lasiocarpa*) and spruce (*Picea* spp.) in spring and early summer to feed on the cambium layer (Power, pers. obs., 2012).

Through spring and summer they will continue to feed on grasses, sedges, dandelions, and other forbs and succulent plants such as cow parsnip (*Heracleum lanatum*) and Indian hellebore *(Veratrum viridae*). In late summer and fall, huckleberries, cranberries, currants, and other berries become a very important component of their diet. During this season, grizzly will also seek out other sources of high quality protein such as spawning salmon (Nietfeld et al., 1985; Stevens and Lofts, 1988). Grizzly bear populations with regular access to animal protein, especially salmon, grow to be the largest bears, have the largest litters, and have the highest densities (Hilderbrand et al., 1999).

Table 1 lists some of the preferred plant and animal foods for grizzly bears.

Table 1: Known and Potential Forage Species for Grizzly Bears in the Study Area

Common Name	Scientific Name	Parts Consumed
Saskatoon	*Amelanchier alnifolia*	berries
kneeling angelica	*Angelica genuflexa*	leaves, stems, roots
kinnikinnick	*Arctostaphylos uva-ursi*	berries
lady fern	*Athyrium filix-femina*	fronds
bluejoint reedgrass	*Calamagrostis canadensis*	leaves
Sitka sedge	*Carex sitchensis*	leaves
sedge	*Carex spp.*	leaves
edible thistle	*Cirsium edule*	flowers
red-osier dogwood	*Cornus stolonifera*	berries
crowberry	*Empetrum nigrum*	berries
fireweed	*Epilobium angustifolium*	leaves, flowers
purple-leaved willowherb	*Epilobium ciliatum*	leaves, flowers
common horsetail	*Equisetum arvense*	foliage
wood horsetail	*Equisetum sylvaticum*	foliage
wild strawberry	*Fragaria virginiana*	berries
cow parsnip	*Heracleum lanatum*	leaves, stems, flowers, roots
Arctic lupine	*Lupinus arcticus*	roots
black twinberry	*Lonicera involucrata*	berries
bog cranberry	*Oxycoccus oxycoccos*	berries
whitebark pine	*Pinus albicaulis*	cone seeds
stink currant	*Ribes bracteosum*	berries
northern blackcurrant	*Ribes hudsonianum*	berries
black gooseberry	*Ribes lacustre*	berries
northern gooseberry	*Ribes oxyacanthoides*	berries
prickly rose	*Rosa acicularis*	hips

Table continues ...

Common Name	Scientific Name	Parts Consumed
Nootka rose	*Rosa nutkana*	hips
nagoonberry	*Rubus arcticus*	berries
dwarf nagoonberry	*Rubus arcticus spp. acaulis*	berries
five-leaved bramble	*Rubus pedatus*	berries
trailing raspberry	*Rubus pubescens*	berries
willow	*Salix* spp.	catkins
mountain ash	*Sorbus* spp.	berries
soopolallie	*Shepherdia canadensis*	berries
common dandelion	*Taraxacum officinale*	foliage, flowers
clover	*Trifolium spp.*	foliage, flowers
stinging nettle	*Urtica dioica ssp. gracilis*	foliage
dwarf blueberry	*Vaccinium caespitosum*	berries
black huckleberry	*Vaccinium membranaceum*	berries
grouseberry	*Vaccinium scoparium*	berries
Sitka valerian	*Valeriana sitchensis ssp. sitchensis*	foliage
highbush-cranberry	*Viburnum edule*	berries
tree cambium	*Picea* spp, *Pinus* spp	cambium under bark
Animal Foods		
ants	Formicidae	larva, adults
wasps	Vespidae	larva, adults
beetles	Coleoptera	larva, adults
moose	*Alces americanus*	carcasses, fresh kills
mule deer	*Odocoileus hemionus*	carcasses, fresh kills
woodland caribou	*Rangifer tarandus caribou*	carcasses, fresh kills
grizzly bear	*Ursus arctos*	carcasses, fresh kills
black bear	*Ursus americanus*	carcasses, fresh kills
sucker sp.	*Catostomus sp.*	carcasses, fresh kills
trout	*Salmo* spp, *Salvelinus* spp	carcasses, fresh kills
voles	*Microtus* spp.	fresh kills
hoary marmot	*Marmota caligata*	fresh kills

Source: Himmer and Power, 1999

Spring Feeding

In early spring, grizzly bears require high protein, digestible forage. They will seek out winter-killed carrion, winter-weakened ungulates, ungulate calves/fawns, and protein-rich early green succulent vegetation. Grasses, sedges, horsetails, and overwintering berries (crowberries (*Empetrum nigrum*) and kinnikinnick (*Arctostaphylos uva-ursi*)) are commonly selected spring food items as these plants develop early and are found in riparian areas, meadows, avalanche tracks, and seepage sites that become snow-free first. Warm southerly aspect avalanche tracks and clearcuts are important feeding habitat because of early exposed vegetation.

Summer Feeding

Throughout summer, grizzly bears will continue to feed in meadows, thickets, stream banks, and open forests on graminoids and succulent forbs such as clovers (*Trifolium spp.*), dandelions (*Taraxacum* spp.), stinging nettle (*Urtica dioica*), cow parsnip (*Heracleum lanatum*), and Indian hellebore *(Veratrum viridae*). Recent clearcuts (5 to 15 years old) in nutrient rich, moist habitats may also be important feeding areas. Berries are utilized as they become available (e.g., black twinberry, elderberry, raspberry, blueberry, currant, red-osier dogwood, and highbush-cranberry). Bears will rip apart rotten logs and overturn rocks searching for insects, especially ants and wasps, that are important summer foods.

Late Summer / Fall Feeding

In late summer and fall, grizzly bears continue to feed on late-producing berry species and other available vegetation. At this season they will also seek out other sources of high quality protein such as spawning salmon. In alpine and subalpine areas, grizzly bears will dig hibernating hoary marmots (*Marmota caligata*) from their burrows to feed on them.

Fall feeding is important for preparation for winter denning and is considered by some authorities to be critical (Mahon et al., 2004; Servheen, 1983; Zager et al., 1980). Preparation of hibernation requires hyperphagia of high-caloric foods such as berries and carcasses in preparation for a long fast during hibernation (COSEWIC, 2002).

Hibernation

Apart from some individual coastal grizzly bears, all grizzly bears in British Columbia hibernate for the winter. In the interior of BC, grizzly bears generally hibernate between October and May although some bears may emerge from their dens as early as March or April. Pregnant females are the first to enter dens in the fall and the last to emerge in the spring (Vroom et al*.,* 1980).

The majority of grizzly bear dens are excavated on moderately steep to steep slopes of about 41% to 90% (Lentfer et al*.,* 1972; Pearson, 1975; Russell et al*.,* 1979; Vroom et al*.,* 1980; Nagy et al*.,* 1983). Sloped sites are often selected because they facilitate easier digging and the slope surface is generally stabilized by root systems of herbaceous plants and trees or boulders. Natural rock caves and cavities under old growth structures, including large old trees and root balls, also make suitable den sites (Aune, 1994).

Hibernating habitats tend to be high elevation areas that are sloped with dry, stable soil conditions that remain frozen during winter (Gyug et al., 2004). Dens are predominantly in alpine or subalpine habitat at mid to upper elevations, and typically 1 km to 2 km away from human activities (Ciarniello et al*.,* 2005). However, grizzly bear dens have also been found at both low (306 masl) and mid elevations (975 masl) (Hatler et al., 2008).

In BC, bears along the Parsnip River primarily excavated dens into the sides of slopes. Ciarniello et al. (2005) found grizzly bears using natural caves in mountainous areas for denning and believed that they were especially important as natal den sites.

Territoriality

Grizzly bears are not truly territorial. While they have individual home ranges, these may overlap and in general, are not aggressively defended. They have low dispersal capabilities (typically 10 km to 30 km depending on sex) relative to other carnivores, particularly for sub-adult females that often establish their home range within or adjacent to the maternal home range (Weaver et al., 1996; McLellan and Hovey, 2001). Home ranges vary greatly in size depending on the age and sex of the bear, the seasonal and annual availability of food, the reproductive status of females, the habitat types, and the population densities (Nietfeld et al., 1985). Home range sizes are proportionate to food quality, quantity, and distribution (Gyug et al., 2004), particularly for females, while the larger male home ranges are likely also strongly influenced by need for spatial overlap with several female home ranges for breeding. Mature males generally have the largest home ranges, which may be several times as large as those of females and may also overlap more than those of females (MacHutchon et al., 1993; Himmer and Gallagher, 1995) but may be as small as 24 square kilometres (km^2) in rich, coastal habitats (LeFranc et al., 1987; MacHutchon et al., 1993). In the BC interior, home ranges are typically between 300 km^2 and 500 km^2 for males and 80 km^2 and 200 km^2 for females (Hatler, 2008). In the Parsnip River area, the mean annual home range sizes for males was 423 km^2 and for females was 59 km^2 (Ciarniello et al., 2003).

Security Habitat (SH)

Habitat use is strongly influenced by intraspecific social interactions (e.g., for breeding, male predation of cubs) and the presence/activities of humans (Gyug et al., 2004). Security habitat is important for sub-adult bears and for females with cubs to avoid adult males, which defend their territories from other males and will kill unknown cubs to bring the female into estrous (LeFranc et al., 1987; Mahon et al., 2004). Security habitat conceals grizzly bears from other bears and from humans and is provided by a combination of vegetation and topography (e.g., swales, gullies, ridges). Forested habitats adjacent to early successional foraging areas are important (Jonkel, 1987). Security habitat and day-bedding area (for heat relief, rain interception, or warmth) tend to be closed forest sites near high quality foraging sites (Gyug et al., 2004). Optimal security is provided by habitats in late successional stages (structural stages 5–7) with canopy closures greater than 50% and a well-developed understory ($\geq$50%) of shrubs. To avoid aggressive males, females with cubs may use forested habitats (structural stages 5–7) while foraging (Pearson, 1975). High quality forage habitats adjacent to roads or other areas of human disturbance may not be used if adequate forest cover is not available (McLellan and Shackleton, 1989).

Thermal Habitat (TH)

Thermal habitat for grizzly bears provides relief from summer heat and may be provided by mature/old growth forest stands with closed canopies (>50% crown closure). Bears will also seek relief from heat by using open water (e.g., ponds, lakes, rivers, streams, and springs) and by using beds in cool, moist sandy areas (Himmer and Power, 1999; LeFranc et al., 1987). In subalpine areas, grizzly bears will use tree or shrub islands as both security and thermal habitat.

4.0 SEASONS OF USE

Food and security are required throughout the growing season while hibernating habitats are the only requirements for the winter months. In the Fraser Plateau ecoregion and the Nazko Uplands ecosection, grizzly bears begin hibernating between mid October and late November and they emerge from hibernation between mid April and late May. **Table 2** summarizes the life requisites required for each month of the year.

Table 2: Monthly Life Requisites for Grizzly Bears

Life Requisites	Month	Season
Hibernation	January	Winter
Hibernation	February	Winter
Hibernation	March	Winter
Hibernation, Feeding, Security/Thermal	April	Winter
Feeding, Security/Thermal	May	Growing (Early Spring)
Feeding, Security/Thermal	June	Growing (Spring)
Feeding, Security/Thermal	July	Growing (Summer)
Feeding, Security/Thermal	August	Growing (Summer)
Feeding, Security/Thermal	September	Growing (Fall)
Feeding, Security/Thermal, Hibernation	October	Growing (Fall)
Feeding, Security/Thermal, Hibernation	November	Winter
Hibernation	December	Winter

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

5.0 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 (Resources Information Standards Committee, 1999). In assigning a suitability rating for grizzly bear 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 grizzly bear for spring, summer, and fall (**Table 3**). Hibernation den sites for bears are not rated separately because of their site-specific nature.

Habitat Use and Ecosystem Attributes

Table 3: Relationship between Terrestrial Ecosystem Mapping (TEM) Attributes and Each Life Requisite for Grizzly Bear

Life Requisite	TEM Attribute
Feeding (FD)	• Site – site series, site disturbance, elevation, slope, aspect, structural stage, site modifier • Vegetation – % cover by layer, species list by layer, structural stage modifier, stand composition modifier, available forage • Soil – flooding regime
Security/Thermal (ST)	• Site – site series, slope, structural stage, structural stage, modifier • Vegetation – total % cover, % cover by layer, stand composition modifier
Hibernating (HI)	• Site – site series, site disturbance, elevation, slope, aspect, site modifier, structural stage, structural stage modifier • Soil – terrain classification, rooting depth, rooting zone particle size, root restricting layer, seepage water depth, flooding regime, soil depth, soil texture, percent coarse fragments

6.0 RATINGS

There is a detailed level of knowledge of the habitat requirements of grizzly bears in BC and therefore a six-class rating scheme is used.

Table 4: Habitat Suitability 6-Class Rating Scheme Used for Grizzly Bear

% 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

Provincial Benchmark (Coastal British Columbia)

Ecosection:	Kitimat Ranges (KIR)
Biogeoclimatic Zone:	CWHvm1 (Coastal Western Hemlock Submontane Very Wet Maritime)
Broad Ecosystem Unit:	Coastal Western Hemlock
Habitats:	Skunk cabbage sites; floodplains, wetlands, estuaries/beaches; the Khutzymateen Valley is the grizzly bear benchmark habitat in British Columbia.

Provincial Benchmark (Interior British Columbia)

Ecosection:	Border Ranges (BRR)
Biogeoclimatic Zone:	ESSFdk (Englemann Spruce – Subalpine Fir Dry Cool) and MSdk (Montane Spruce Dry Cool)
Broad Ecosystem Unit:	Engelmann Spruce – Subalpine Fir
Habitats:	Avalanche chutes; the Flathead Valley is the interior grizzly bear benchmark habitat in British Columbia

Ratings Assumptions for Grizzly Bear

- Riparian areas and other ecosystems with preferred sedges, grasses and herbs are rated high (up to class 1) in spring, as these areas should provide abundant, new, succulent forage.
- Units with preferred species of herbs and berry-producing shrubs are rated high in summer (up to class 1). Structural stages 2 and 3 may provide abundant forage and have good spring and summer values (up to class 1). Clearcuts on rich, moist sites should provide moderate to high summer forage (classes 3 to 1). Structural stages 4 and 5 stands generally have poor, year-round feeding value (up to class 4).
- Structural stage 1 (non-vegetated) provides no significant food and is rated class 6.
- Structural stages 6 and 7 (mature forest to old forest) provide optimal security and are rated up to class 1.
- Structural stages 3a and 3b are rated up to class 3 for security cover.
- Structural stage 5 (young forest) provides poor security and is generally rated low (up to class 4).
- Structural stage 1 and 2 (non-vegetated and herbaceous) provides no significant security and is rated class 6.
- Hibernation is dependent on digging substrate, slope, and the presence of old growth structures, but structural stages 1–5 may contain residual old growth features (e.g., snags and large stumps) and so may be similarly rated up to high (classes 1 or 2).

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