Current Condition Report for Grizzly Bear in the Omineca Region | 2019 Analysis

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Companion Documents

Interim Assessment Protocol for Grizzly Bear in British Columbia – Standards for Assessing the Condition of Grizzly Bear Populations and Habitat under British Columbia's Cumulative Effects Framework. Version 1.2 (October 2020). Prepared by the Provincial Grizzly Bear Technical Working Group – Ministry of Environment and Climate Change Strategy and Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 45 pp.

https://www2.gov.bc.ca/assets/download/B2D0CE24E5524AC6B4910E759BF65A97

Cumulative Effects Framework Interim Policy for the Natural Resource Sector (October 2016). 32 pp.

https://www2.gov.bc.ca/assets/download/9342A9C980A7440C9E5A15EA591912D4

Grizzly Bear Value Summary (April 2016) – Draft for Discussion. Prepared by the Ministry of Environment and Ministry of Forests, Lands and Natural Resource Operations. 16 pp.

https://www2.gov.bc.ca/assets/download/23A5372CF84444A7887B841A4B33E9CF

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EXECUTIVE SUMMARY

This current condition assessment for Grizzly Bear in the Omineca Region is carried out under BC's Cumulative Effects Framework (CEF) and follows the methods set out in the Interim Assessment Protocol for Grizzly Bear in British Columbia. Using data from 2019, 10 indicators are used to describe and assess the status of grizzly bears and habitat relative to the provincial government's broad objectives for grizzly bears.

Risks to grizzly bears are assessed and reported at two scales: large Grizzly Bear Population Units (GBPUs) and smaller Landscape Units (LUs). Populations are managed within the former, while habitat objectives are managed within the latter.

Indicators showing where management attention is needed in the Omineca Region are driven by human activity that can result in increased mortality risk due to encounters with humans and habitat displacement (either through direct alteration of habitat or resulting avoidance of habitat). The GBPUs of most concern based on this assessment are the Nulki, Moberly and Nation GBPUs and as such, require management attention when making decisions that influence grizzly bears and/or their habitat in these GBPUs.

The areas with the highest potential impacts to grizzly bears centre, unsurprisingly, around the major communities and travel corridors in the region. This includes the areas around the communities of Prince George, Vanderhoof and Fort St. James (Nulki and Nation GBPUs) and Mackenzie (Moberly GBPU; note this GBPU extends into the Northeast Region and is jointly managed by the Omineca and Northeast Regions). In these areas, the amount of undisturbed habitat is low (core security area indicator) and the likelihood of human/bear encounters that are lethal for bears are higher (front country, road density and hunter day density indicators). Impacts to grizzly bears are driven by human activity in communities, rural agriculture and increasing backcountry access created by forestry activities moving northward through the region.

There are some additional areas further north towards the Williston Reservoir where potential impacts to grizzly bears are also high resulting from low core security areas and higher road density (and therefore, human access). Impacts to grizzly bears in this area are driven primarily by forestry activities moving northward through region.

The potential for low forage for grizzly bears (forests in a mid-seral stage with closed canopy and little opportunity for berry production) is not flagged throughout most of the region; however, additional measures should be taken to incorporate more temporal variation to this indicator to include a signal for decision-makers of potential upcoming foraging constraints (i.e., the amount of current early seral forest that will turn into mid-seral).

Additional supplemental indicators such as bear density, road density, the presence of Wildlife Habitat Areas (WHAs) and the amount of protected grizzly bear habitat provide further information and context to the assessment results.

Resource specialists and decision-makers should consider mitigation measures when reviewing proposed land use activities in the Omineca Region to reduce incremental loss of grizzly bear habitat and mortality pressure to grizzly bears. The indicators in this report highlight where the spatial constraints on grizzly bear habitat are highest in the region. Mitigation measures could include:

- Establishing grizzly bear WHAs in locations where grizzly bear habitat capability is high but populations are pressured by the combined effects of high road density, high hunter day density, and low core security areas;
- Deactivating and/or restricting access on roads and corridors in high priority grizzly bear habitat, particularly where forage capability is high but core security areas do not exist; and,
- Adjusting forest planning practices in priority grizzly bear habitat to conserve or enhance the long-term availability of seasonal foraging habitats (e.g., berry production).

LIST OF ACRONYMS

B.C.	British Columbia
BEC	Biogeoclimatic Ecosystem Classification
BEI	Broad Ecosystem Inventory
CEF	Cumulative Effects Framework
CID	Compulsory Inspection Database
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
FLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
FRPA	*Forest and Range Practices Act*
GBPU	Grizzly Bear Population Unit
LEH	Limited Entry Hunt
LU	Landscape Unit
LUO	Land Use Order
LUP	Land Use Plan
MOE	Ministry of Environment and Climate Change
TEM	Terrestrial Ecosystem Mapping
WHA	Wildlife Habitat Area
WMU	Wildlife Management Unit

GLOSSARY

Benchmarks	Reference points that support interpretation of the condition of an indicator or component. Benchmarks are based on scientific understanding of a system and may or may not be defined in policy or legislation. For the purpose of the Cumulative Effects Framework (CEF), benchmarks are identified to support assessment and reporting in relation to broad objectives (BC MFLNRO & BC MOE, 2016).
Cumulative effects	Under the Provincial CEF, cumulative effects are defined as changes to environmental, social and economic values caused by the combined effect of past, present and potential future human activities and natural processes.
Grizzly Bear Population Units (GBPUs)	Grizzly bears exist as a set of interconnected populations, which can be divided into sub-populations based on bear ecology using grizzly bear population units. Grizzly bear population units (GBPUs) delineate individual bear populations for conservation and management. In total, there are 55 GBPUs in B.C.
Landscape Units (LUs)	Landscape units (LUs) are areas of land and water used for long-term planning of resource management activities, with an initial priority for biodiversity conservation. LUs are important in creating objectives and strategies for landscape-level biodiversity and for managing other forest resources.
Precision	Precision is defined as the level of confidence associated with the data inputs used in each indicator. Precision ranking (i.e., high vs. moderate vs. low) indicates the level of confidence in the indicator output/results derived from the input within the region.
Relevance	Relevance is defined as the level of importance of each indicator within the region (i.e., all indicators do not necessarily have the same level of relevance throughout the province).
Wildlife Management Units (WMUs)	Delineated administrative regions for wild game management. The Province of B.C. is divided into nine administrative regions, having a total of 225 WMUs.

1 INTRODUCTION

The Province of British Columbia (B.C.) is committed to sustainable resource management. As resource demands grow, we must be able to measure the effects of natural resource activities, large and small, on the values important to the people of British Columbia. To meet this need, the Province of B.C. (the Province) established a Cumulative Effects Framework (CEF) in 2014 to guide the assessment of cumulative effects[1] across natural resource sectors and support the integration of assessment results in natural resource decision-making.

As part of the CEF, the Province carried out a provincial assessment of the current condition of several resource values of importance to British Columbians, using indicators for each value that illustrate the cumulative effects of natural resource activities on these identified values.

This report provides an overview of the current condition of grizzly bear within the Omineca Natural Resource Region (Omineca Region) as of 2019. This assessment uses a methodology that examines the status of grizzly bear populations, the capacity of grizzly bear habitat to provide adequate food and shelter, and the risks associated with human presence in grizzly bear habitat.

In particular, this report includes:

- An overview of grizzly bear ecology and habitat requirements, threats to habitat and survival, and government objectives and legal protection tools for the species;
- An overview of indicators and methods used to assess the current condition of grizzly bears within the Omineca Region, including any limitations of the assessment;
- Results and regional interpretation for each indicator, including assessment maps and links to further data;
- A summary of the results and key contributing factors influencing the results; and,
- A summary of opportunities to enhance grizzly bear populations and habitat within the Omineca Region.

The results generated from this report are based on a provincial assessment and are intended to inform various resource management decisions that influence the conservation and management of grizzly bear populations and habitat in the Omineca Region.

Overall, this report aims to support and inform collaborative discussions on cumulative effects between government decision-makers, First Nations, natural resource industries, and community stakeholders to ensure that cumulative effects are identified, considered, and managed appropriately.

[1] Under the Cumulative Effects Framework, cumulative effects are defined as changes to environmental, social and economic values caused by the combined effect of past, present and potential future human activities and natural processes.

2 GRIZZLY BEAR OVERVIEW

In B.C., grizzly bears have a significant ecological, cultural, and economic importance. Ecologically, they are an umbrella species that reflect the overall health of the ecosystems they inhabit. Many First Nations in B.C. include grizzly bears in their cultural and spiritual traditions, histories, and philosophies, and ecotourism and bear viewing also contribute to the provincial economy.

Grizzly bears are identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as a species of "special concern" in Canada,[2] given their sensitivity to human activities and disturbance (COSEWIC, 2012). Grizzly bears are also identified as a species of Special Concern (Schedule 1) in the federal *Species at Risk Act* (SARA)[3] (Government of Canada, 2011). Under B.C.'s Conservation Framework,[4] grizzly bears are identified as a high priority for conservation (BC MELP, 1995).

The following sections provide a general overview of grizzly bears in the Omineca Region, including a description of their habitat needs, dietary preferences, and distribution. The potential threats to grizzly bear populations and habitat in the Omineca Region are also described below along with provincial and regional management objectives that are in place for the species.

2.1 HABITAT & DIET

Grizzly bears require large, connected areas to meet their life requisites. Large-scale connectivity of habitat is very important for grizzly bear populations, with their home range sizes being proportionate to the quality, quantity and distribution of food (BC MWLAP, 2004b).

Grizzly bears favour a variety of habitats over different seasons for forage, cover, and hibernation purposes. Alpine areas (ridgetops, talus slopes, avalanche chutes), subalpine meadows and forests, grasslands, shrublands, creek/river bottoms, fluvial/alluvial floodplains, wetlands, and riparian areas in montane and foothill ecosystems are all habitats that are important for grizzly bears.

In addition to suitable feeding areas, grizzlies require forest cover for thermal regulation, security, and resting. Grizzly den sites vary from alpine/subalpine talus slopes, shrubfields and krummholz[5] areas to various timbered subalpine and lowland areas. Mountain valley bottoms (riparian habitats) and ridgetops serve as travel corridors. Corridors connect different habitat units, preventing isolation and enabling bears to travel to key food sources.

[2] COSEWIC assessment and status report on the Grizzly Bear Ursus arctos in Canada. Committee on the Status of Endangered Wildlife in Canada. https://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_ours_grizz_bear_1012_e.pdf

[3] Government of Canada. Species Profile- Grizzly Bear. https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1195

[4] Province of BC. Conservation Framework. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk/setting-priorities/conservation-action-tools

[5] Krummholz are areas of stunted windblown trees growing near the tree line on mountains.

As a grizzly bear's habitat use varies with the seasons, so does a grizzly bear's diet. Forbs, grasses, sedges and other herbaceous vegetation is consumed in spring and early summer. During these seasons, grizzly bears exploit moist fens and riparian areas which produce high densities of prime summer vegetation. In the late summer and fall, berries and roots are an important additional component of their diet.

Human-disturbed sites, like roadways, tend to support early succession vegetation, which is favoured by grizzly bears.[6] Other important feeding areas include recently logged areas where early seral plant communities are abundant.[7]

Ants, ground squirrels, and spawning salmonids are also consumed by grizzly bears when available. Predation on ungulates is not a foraging strategy employed by all grizzly bears; however, some grizzly bears will opportunistically predate on ungulates, especially young or those in poor condition (BC MWLAP, 2004b).

2.2 DISTRIBUTION & MANAGEMENT IN THE OMINECA REGION

Grizzly bears are found throughout the Omineca Region, apart from a small extirpated[8] portion in the southern part of the region, south of Prince George (Figure 2.1). This extirpated area is contiguous with an area of the province (stretching from the United States border and into the southern tip of the Omineca Region) that has been impacted by habitat loss associated with human settlement and establishment of agricultural areas.

[6] However, proximity of grizzly bears to roads and other linear corridors may increase the likelihood of human-bear encounters and subsequently, mortality risk. Road development as a potential threat to grizzly bears is discussed further in section 2.3.

[7] Conversely, areas in mid-seral stage may have sub-optimal forage potential and represent a potential threat to grizzly bears. The amount of mid-seral dense conifer forest (by BEC zone) within each LU is evaluated in section 4.8.

[8] Extirpated means there is no evidence of resident reproductive females. Extirpation does not preclude ephemeral movements of grizzly bears from adjacent population units that could be characterized as forays by resident adults or sub-adult dispersals (Apps, 2013). Numerous anecdotal sightings of grizzly bears in this area support this theory.

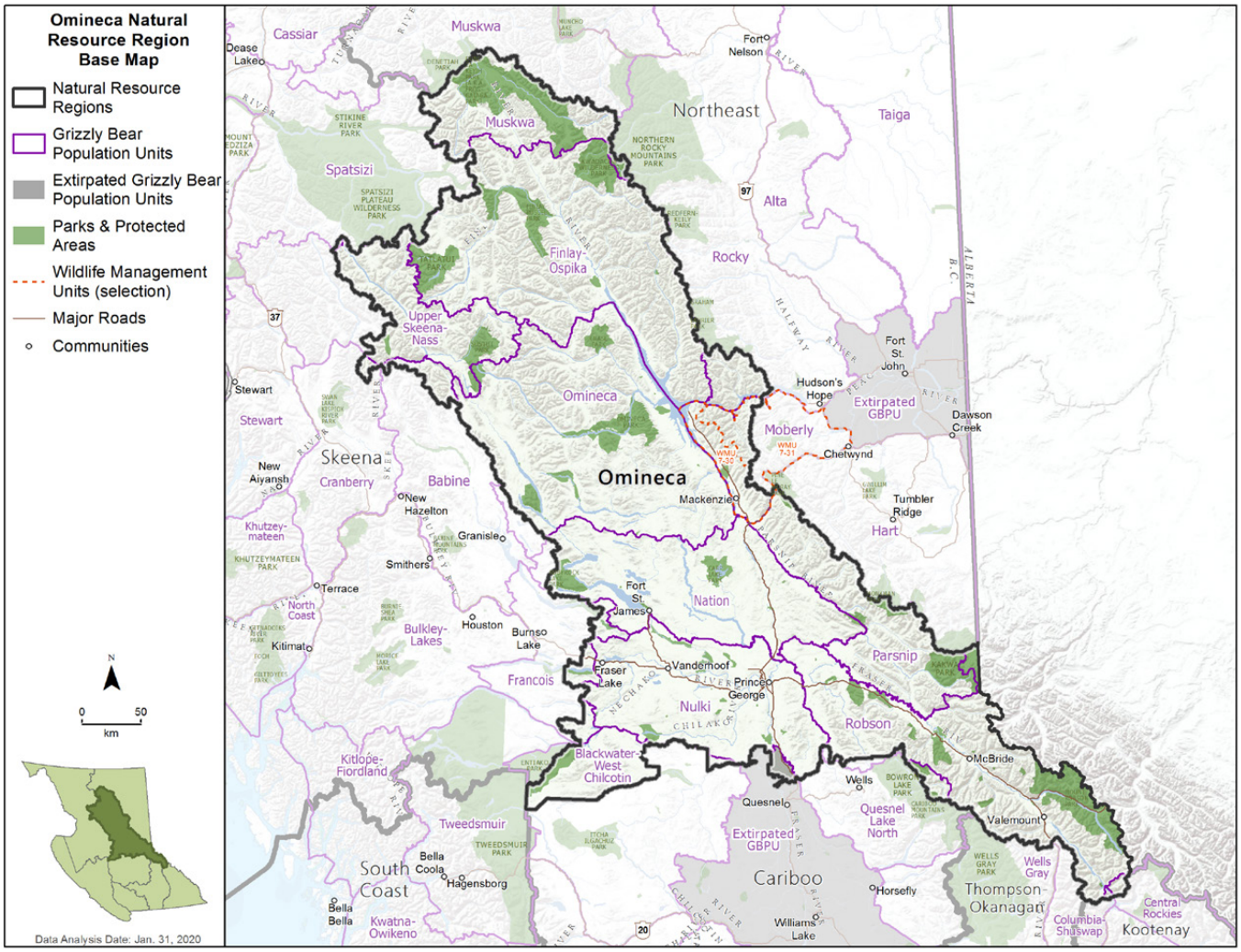

Figure 2.1 *Map of the Omineca Region*

There are 15 grizzly bear population units[9] (GBPUs) wholly or partially located within the Omineca Region (Figure 2.1). Of these 15 GBPUs, the Omineca Region leads the management of six GBPUs that fall within the boundaries associated with Region 7A: Finlay-Ospika, Omineca, Nation, Parsnip, Robson, and Nulki. The Omineca Region also co-manages one GBPU with the Northeast Region (Moberly), and defers management of the remaining eight GBPUs to the neighbouring regions in which the majority of that GBPU is contained (Skeena, Cariboo and Northeast Natural Resource Regions). This report only provides information for the seven GBPUs and 166 LUs managed and co-managed by the Omineca Region (Table 2.1).

There are 32 Wildlife Management Units (WMUs) for which game management objectives and hunting regulations are set that overlap with the seven GBPUs managed and co-managed by the Omineca Region. Results are not presented at the WMU scale in this report; however, WMU boundaries could be overlaid with results at the GBPU and LU scale to provide additional information for decision-makers.

[9] GBPUs are delineated based on similar behavioural ecotypes and sub-populations of bears; they generally follow ecological boundaries and transitions (e.g., heights of land) that are not necessarily barriers to movement, nor do they delineate actual population boundaries.

Please refer to the current condition reports for neighbouring regions for further information via the Provincial Cumulative Effects Framework website.

Table 2.1 *GBPUs, WMUs, and LUs Managed by the Omineca Region*

GBPU	Number of LUs[10]	WMUs in Region 7A
Finlay-Ospika	28	7-37, 7-39 to 7-41
Omineca	39	7-27 to 7-29, 7-38
Moberly	10	7-30
Nation	24	7-13, 7-14, 7-16, 7-24 to 7-26
Nulki	15	7-07 to 7-13, 7-15
Parsnip	19	7-17, 7-18, 7-23
Robson	31	7-01 to 7-07

2.3 POTENTIAL THREATS TO GRIZZLY BEARS

Past, present, and future human activities and natural disturbances have the potential to impact grizzly bear populations and habitat. Cumulative effects from various sources may contribute to habitat loss, alteration, fragmentation, and population decline over time. Potential threats to grizzly bears in the Omineca Region include industrial activities, road development, human presence, access management and climate change.

Industrial Activities

Forest harvesting exists throughout the Omineca Region. Agriculture is present around the communities of Prince George, McBride and Vanderhoof, with more limited agriculture around Mackenzie. In addition, two large mines, Mount Milligan and Kemess, are also located in GBPUs managed by the Omineca Region.[11] These activities vary in size and may operate on different temporal scales (e.g., year-round or seasonally).

Forest harvesting, agriculture and mining may contribute to habitat loss and/or fragmentation and displacement of grizzly bears from project areas, and further expansion of these activities is likely to exacerbate these adverse impacts to grizzly bears. Moreover, road networks associated with industrial activities increase the ability of people to access otherwise inaccessible backcountry areas. Impacts of road development on grizzly bears are discussed below.

[10] LUs not wholly contained within a GBPU are considered to be inside the GBPU with the highest overlap percentage.

[11] The Mount Milligan Mine is located in the Omineca GBPU and Kemess Mine is located in the Finlay-Ospika GBPU. The Endako Mine is also located in the Omineca Region but not in a GBPU managed or co-managed by the Omineca Region.

Road Development

Roads and corridors associated with the development of industrial activities and human settlement affect grizzly bear populations and habitat in negative and positive ways. Road development results in direct habitat loss and fragmentation, as well as indirect loss of habitat and displacement from preferred habitats near and along roadways due to noise and human presence and activity.[12] Furthermore, most grizzly bear mortality from human encounters occurs within 500 metres of a road.

However, areas with low road density are more favourable for grizzly bears and can attract them due to roadside seeding, linear movement corridors, and increased prey availability. Grizzly bears use linear corridors for foraging, digging, berry feeding, bedding and travel, which increases the chance of encountering humans, human activity and the non-natural attractants therein (Boulanger et al., 2013). This can include urban and rural communities, industrial camps and worksites, hunting camps for species other than grizzly bear, and their associated access roads. Moreover, the development of roads also allows easier human access into grizzly bear habitat, which in turn increases the risk of human-bear encounters and mortality risk.

Human Presence & Access Management

Grizzly bears are attracted to livestock, livestock feed, and grain crops around communities as non-natural food sources, as well as other attractants such as road kill, landfills, urban waste, and fruit trees. If these attractants are present in urban or rural areas, they may contribute to increased likelihood of human-bear encounters.

Human-bear encounters may also increase if humans expand into or are able to access remote areas, leading to habitat loss, fragmentation, displacement, and potentially mortality. Outdoor commercial operations and recreational enthusiasts may also contribute to cumulative pressures on grizzly bears through the use of river boats, small planes, helicopters, and drones that are used by these groups, leading to permanent or temporal displacement of grizzly bears.[13]

Climate Change

The effects of climate change on grizzly bears are uncertain because climate change may create both positive and negative environmental conditions for grizzly bears. See the inset box for a description of the anticipated effects of climate change on grizzly bears in the Omineca Region.

[12] Although Government tracks human-caused grizzly bear deaths, the other impacts of humans (e.g., industrial activity, traffic, noise) on bears (such as habitat displacement) are not well-known and are an important research priority.

[13] Although Government tracks human-caused grizzly bear deaths, the other impacts of humans (e.g., industrial activity, traffic, noise) on bears (such as habitat displacement) are not well-known and as such, are an important research priority.

Climate Change

The climate in the Omineca Region has changed over the past century and is expected to continue to change (BC MFLNRO, 2016). Projections suggest that by the end of this century the region may warm, on average, an additional 1.3 to 2.7°C. Winter precipitation is projected to increase, but projections for summer precipitation are highly uncertain, with potential increases or decreases. Even with increased precipitation, increased temperatures will result in decreased moisture availability in summer. Some sub-regions may experience periods of relative drought. Spring precipitation as snow is projected to decrease, resulting in reduced snowpack. Warmer temperatures and less spring snowfall will result in a longer growing season.

Climate envelopes, climatic conditions associated with currently mapped biogeoclimatic zones, are expected to shift upslope and northward across the province. Projections suggest that climate envelopes for current biogeoclimatic zones in the Omineca Region may shift 60-200m upward in elevation and 10-170km northward by mid-century. Sub-alpine and alpine habitats are projected to contract significantly. The increased prevalence of natural disturbance will vary by climatic sub-region, elevation and forest type. Substantial increases in fire risk are not projected, but uncertainty is high due to climatic complexity associated with the jetstream.

Grizzly bears are highly adaptable omnivores with a diverse foraging strategy; predicting the multiple trophic effects of climate change on bears is complicated (BC MFLNRORD, in prep.). Their ability to move long distances across different habitat types to track seasonally available forage should buffer against some of the anticipated effects of climate change (Ciarniello, 2018). Nevertheless, climate change will influence availability of important seasonal food sources (Ciarniello, 2018). Lack of high-quality foods during the fat deposition period in late summer and fall may impair body condition prior to hibernation (Mowat & Heard, 2006). Adult females with low body fat will have smaller litters at longer intervals; those with very low (≤20%) body fat may not give birth at all (Robbins et al., 2012).

Climate change is expected to alter the spatial and temporal availability of fleshy fruits, a critical high-energy food source in late summer and fall. Black huckleberry (*Vaccinium membranaceum*) is the primary species consumed by grizzly bears across the province; fruiting species of secondary importance in the Omineca Region may include soopolallie/buffalo-berry (*Shepherdia canadensis*), oval-leaved blueberry (*Vaccinium ovalifolium*), devil's club (*Oplopanax horridus*), crowberry (*Empetrum nigrum*), and kinnikinnick (*Arctostaphylos uva-ursi*) (Ciarniello, 2018). Black huckleberry distribution in the Omineca Region is projected to expand northward and into higher elevations where soil conditions are suitable (Prevéy et al., 2020). Berry supply may be variable, decreasing in areas affected by drought, yet increasing in areas disturbed by fire. Warmer winter and spring temperatures are expected to advance the timing of flowering and fruit production, potentially affecting berry quality and quantity. Earlier flowering may increase risk of frost damage and/or asynchronization with pollinators, resulting in berry crop failures. Earlier ripening may widen the gap between berry availability and hibernation, negatively affecting female body condition and reproduction (Laskin et al., 2019).

Spatiotemporal availability of other seasonal plant foods is also projected to change. Herbaceous vegetation (forbs, grasses, sedges) will be available earlier in spring and later into the fall/winter as a result of a longer growing season, thereby extending the foraging period (Ciarniello, 2018). Summer moisture deficit, however, may constrain vegetation productivity in some Omineca sub-regions (BC MFLNRO, 2016). Supply of plant roots in high-elevation habitats, an important food source before and after herbaceous vegetation is available (Coogan et al., 2012), may decline due to woody encroachment of alpine/sub-alpine meadows (Roberts et al., 2014). Other high-value foraging habitats may become limited. For example, some wetlands may become forested due to summer moisture deficit (BC MFLNRO, 2016), and avalanche chutes may become less common due to reduced snowpack (Butler, 2012).

Climate change is expected to affect abundance and distribution of terrestrial prey and salmon. Healthy ungulate populations are important for interior bears in areas where quality and abundance of plant foods is low (Ciarniello, 2018). Moose and caribou populations are declining in the Omineca Region (Kuzyk, 2016; BC MFLNRO, 2017; BC MFLNRORD, 2020); how this will affect Omineca grizzly bears is unknown given that grizzly bears are opportunistic predators and not all individuals consume meat (Ciarniello, 2018). Anadromous salmon (chinook and sockeye), although not thought to be a significant food source for central interior grizzly bears (Mowat & Heard, 2006), is projected to decline (Grant et al., 2019). Landlocked salmon (kokanee), however, may be important for bears in the Nulki, Nation, Omineca, and Finlay-Ospika GBPUs (Mowat & Heard, 2006). Projected hydrological regime changes, warmer stream and lake temperatures, and increased sedimentation (BC MFLNRO, 2016) will negatively affect kokanee (BC MF, 1999).

Warming temperatures may benefit interior grizzly bears, especially those individuals dependent on colder and less productive environments (Nielsen et al., 2013), such as the northern boreal mountains in the Omineca Region. The expected northern and upslope shift of critical food sources such as huckleberries, and a longer foraging season, may offset losses of other food sources such as plant roots in alpine habitats (Roberts et al., 2014). Although grizzly bears have the capacity to adapt to alternative food sources under a changing climate, resiliency of grizzly bear populations will depend on secure access to critical food sources (Ciarniello, 2018). Human-caused mortality, either directly through human-bear conflicts or indirectly through habitat loss, will likely continue to threaten grizzly bear populations. Warmer temperatures are expected to shorten the hibernation period, increasing the risk of human-bear conflicts. Land use will likely expand and/or shift with the changing climate, contributing to further habitat loss. To ensure persistence of grizzly bears, the risk of human-caused mortality must be minimized by maintaining connectivity between core security areas. This is particularly important where density of human settlements and roads is high, such as the central plateau landscapes in the Omineca Region (Ciarniello et al., 2009).

2.4 GRIZZLY BEAR MANAGEMENT, OBJECTIVES AND GUIDANCE

In B.C. and in the Omineca Region, the management and conservation of grizzly bears is governed by a number of provincial and regional strategies, land use plans, management plans and legislation. While not legally enforceable, strategies, management plans and land use plans provide value insofar as they outline important management and conservation objectives.

A brief description of the Provincial Grizzly Bear Conservation Strategy and Omineca Region's Land and Resource Management Plans, which outline several important management and conservation objectives, is provided below (for more detailed information, please refer to **Appendix 1**):

- **Provincial Grizzly Bear Conservation Strategy**: "maintain in perpetuity the diversity and abundance of grizzly bears and the ecosystems upon which they depend" (BC MELP, 1995).
- **Conservation Ranking of Grizzly Bear Population Units (2019)**:
  - ensure grizzly bear populations are sustainable, including managing for genetic and demographic linkage;
  - continue to manage lands and resources for the provision of sustainable grizzly bear viewing opportunities; and,
  - where appropriate, restore the productivity, connectivity, abundance and distribution of grizzly bears and their habitats.
- **Land and Resource Management Plans**[14] for the Omineca Region call for:
  - protecting critical grizzly bear habitat in Wildlife Habitat Areas (WHAs);
  - integrating priority grizzly bear habitats into connectivity corridors;
  - maintaining forest attributes suitable for high capability grizzly bear habitat;
  - minimizing new roads and deactivating/restricting access on existing roads;
  - minimizing negative human-bear interactions through public education; and
  - maintaining economic opportunities: hunting and bear viewing.

Legally enforceable measures for the management and conservation of grizzly bears may be available under existing legislation. A brief description of opportunities that may be available is provided below (for more detailed information, please refer to **Appendix 1**):

- ***Forest and Range Practices Act* (FRPA) Government Actions Regulation**: under section 9, the minister responsible for the *Wildlife Act* by order may establish an area as a WHA if satisfied that the area is necessary to meet the habitat requirements of a category of species at risk or regionally important wildlife.[15]

[14] For more information on the Land and Resource Management Plans in the Omineca Region, visit https://www2.gov.bc.ca/gov/content?id=3E6B048F8D1646F9A2AD7A1E21AF63D6

[15] WHAs may only be established in cases when the establishment does not unduly impact provincial timber supply and does not have a material adverse impact on delivered wood costs.

- ***Wildlife Act***: the hunting of grizzly bears is regulated under the *Wildlife Act*; in December 2017, the provincial government closed the licensed grizzly bear hunt. Furthermore, under section 109 of the Act, the minister may make regulations that prohibit or restrict public access to designated areas of the province for the purposes of wildlife management, and for the temporary closure or imposition of restrictions on vehicular access to a highway or road for the purpose of protecting wildlife.[16]
- ***Environmental Assessment Act***: the environmental review and certification of major projects (e.g., mines, pipelines, hydropower generation) can set legally binding conditions that mitigate the impacts of the project on grizzly bears.
- ***Land Act***: under section 16, the minister may temporarily withdraw Crown land from disposition under the Act for any purpose the minister considers advisable in the public interest and may impose any terms and conditions the minister considers necessary or advisable on the use of the land temporarily withdrawn. Under section 17, the minister may designate a portion of Crown land for a particular use or for the conservation of natural or heritage resources and may impose any terms and conditions the minister considers necessary or advisable on the use of the land designated.

The CEF assessment is part of a suite of tools informing grizzly bear management, extending from conservation assessment to operational management and monitoring. These include the Federal and Provincial status of the Western Grizzly Bear population, the Provincial ranking of conservation concern (Morgan et al., 2019), and the Province's upcoming Grizzly Bear Management Plan. The conservation assessments provide a scientific evaluation of the state of grizzly bears, whereas the CEF assessment describes indicators that are more tightly coupled with resource management objectives and practices to address risks to bears. The Grizzly Bear Management Plan will enable further regional actions for managing factors that impact grizzly bears.

[16] The approval of the minister responsible for the highway or road is required for the temporary closure or for the imposition of restrictions on vehicular access.

3 INDICATORS AND METHODOLOGY

3.1 METHODOLOGY & DATA

This current condition assessment uses the methodology and procedures outlined in the Interim Assessment Protocol for Grizzly Bear in British Columbia, 2020 (the Protocol) (BC MFLNRORD & BC MOECCS, 2020). The Protocol provides a foundation for a consistent approach to assessing the status of grizzly bears in B.C. and provides a clear link to management actions. The conceptual assessment model (**Appendix 2**) provides an overview of the functions, processes and indicators that affect grizzly bears, based on the current scientific understanding of grizzly bear ecology.

In this report, the current condition of grizzly bear populations within the Omineca Region is assessed using data from 2019. A variety of data sources are used in this assessment and are disclosed in the Protocol and its relevant appendices.

3.2 ASSESSMENT UNITS

Risks to grizzly bears are assessed and reported at two scales: large Grizzly Bear Population Units (GBPUs) and smaller Landscape Units (LUs). GBPU boundaries identify similar behavioural ecotypes and sub-populations of grizzly bears for the purposes of management and conservation. LUs are a spatially defined area of land and/or water used for long-term planning of resource management activities.[17] GBPUs and LUs may overlap with other land and resource use planning polygons, including other Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) Regions, WMUs, as well as parks and protected areas for which habitat protection objectives are set.

In this report, the results for all the indicators (except Population Rank) are extrapolated and reported at the much smaller LU scale to inform resource management planning and decision-making at strategic, tactical and operational scales. The Population Rank indicator is the only indicator reported at the GBPU scale.

3.3 INDICATORS

Ten indicators are used to describe and assess the status of grizzly bear populations and habitat relative to the provincial government's broad objectives for grizzly bears.

Table 3.1 below provides a brief description of the population and habitat indicators that were used in this assessment. **Appendix 2** provides a conceptual model that illustrates how the indicators work together to influence the functions and processes that support grizzly bear populations and habitat.

In Section 4, the approach to assessing each indicator is explained in more detail to help readers interpret the results. Additionally, an assessment of the value of the results (level of **precision** and **relevance**) for informing management responses is provided for each indicator, along with a regional perspective on potential next steps to strengthen the information needed to support management responses.

[17] LUs more closely approximate the size of one to several adult female home ranges.

Table 3.1 *Overview of Grizzly Bear Assessment Indicators*

Indicator	Description	Spatial Scale
Population Indicators		
Population Rank*	The conservation status of each GBPU in B.C.	LU
Number of Bears+	The estimated number of bears per 1000 km^2 within each GBPU	LU
Mortality Rate*	The percent female mortality of the estimated total GBPU grizzly bear population compared against mortality reference points	LU
Road Density+	The total length of roads (and pipeline corridors, transmission line rights-of-way, and rail lines) divided by total LU area (km/km^2)	LU
Core Security Area*	Patches of secure grizzly bear habitat (with minimal likelihood of human use) greater than 10 km^2	LU
Front Country*	Urban and rural landscapes (including rural roads up to 2 hours travel time from cities) that have relatively high human density as well as grizzly bear attractants (e.g., livestock, grain crops, fruit trees, human food, garbage)	LU
Hunter Day Density*	The number days per year that hunters occupy WMUs	LU
Habitat Indicators		
Poor Forage Potential (Mid-Seral Dense Conifer)*	The amount of mid-seral dense conifer forest (by BEC zone) within each LU, to represent areas of grizzly bear habitat that have sub-optimal forage production	LU
Quality Food+	The BEI capability of ecosystems to produce vegetation grizzly bears forage for (e.g., forbs, grasses, sedges, berries), plus salmon biomass	LU
Habitat Protection+	The amount of high capability grizzly bear habitat within a LU that is protected in conservation areas and wildlife habitat areas	LU

Note: * Core indicators= the primary flags for identifying potential sources of risk to grizzly bears.
+ Supplemental indicators= intended to provide more detail and contextual information to aid in informing decisions.

For more insights into the grizzly bear assessment methodology, indicators, and data sources, refer to the Interim Assessment Protocol for Grizzly Bear in British Columbia (2020).

3.4 INTERPRETING FLAGGED UNITS ON THE LANDBASE

This assessment uses flags to highlight areas where the condition of an indicator has exceeded a benchmark.[18] **These flags are provided for information only and do not necessarily equate to areas of actual adverse impacts to grizzly bear populations or habitat within a region, GBPU, or LU.**

Benchmarks are based on our scientific understanding of a system and may be based on empirical evidence or expert opinion. In either case, flagged areas simply highlight areas that require further investigation by regional specialists and decision-makers to determine the current condition for grizzly bears and what potential mitigation or management responses may be required.

The current condition of each indicator is interpreted with reference to benchmarks (where applicable) by assessment unit. The results of the indicator assessment are reported on a gradient colour scale (Table 3.2) that reflects increasing potential effects to the value and indicates the benchmark value, where applicable.

Table 3.2 *Colour Scale for Interpreting Effects to Grizzly Bears*

Gradient Scale	Indicator Condition
	Above Benchmark 4
	Above Benchmark 3
	Above Benchmark 2
	Above Benchmark 1
	Below Benchmark
	Not Assessed: Extirpated or Never Occupied

Increasing potential effects to grizzly bears

[18] Benchmarks are defined as reference points that support interpretation of the condition of an indicator or component. Benchmarks are based on our scientific understanding of a system and may or may not be defined in policy or legislation. For the purpose of the CEF, benchmarks are identified to support assessment and reporting in relation to broad objectives (BC MFLNRO & BC MOE, 2016).

4 ASSESSMENT RESULTS BY INDICATOR

This section provides a high-level overview and key to interpreting the assessment results. The results for all 10 indicators are presented along with maps and regional commentaries. The regional commentary provided for each indicator describes and elaborates upon the maps. These sections interpret the meaning of the results, identify relevant contributing or causal factors, provide supporting numerical data where it is useful, and discuss limitations (if any).

As iterated above, this report only discusses the current condition of the seven GBPUs (and associated LUs) that are managed or co-managed by the Omineca Region. This includes the Finlay-Ospika, Omineca, Nation, Parsnip, Robson, and Nulki GBPUs that are directly managed by the Omineca Region, as well as the Moberly GBPU that is co-managed with the Northeast Region. For information on the Muskwa and Rocky, Upper Skeena Nass, or Blackwater-West Chilcotin GBPUs, refer to the Northeast, Skeena, and Cariboo current condition reports, respectively.

To facilitate comparison of assessment results across LUs and indicators, **Appendix 3** includes a comprehensive table of LUs that are flagged/not flagged by indicator that highlight where there are higher risks to grizzly bears that warrant further investigation.

Reviewers are also encouraged to explore the results further within their areas of interest using provincial data sources outlined in **Appendix 4** and through the Omineca Region's online, interactive dashboard and web mapping tool.

While the Protocol was developed by provincial subject matter experts in FLNRORD and the Ministry of Environment and Climate Change (MOE),[19] the following assessment results and recommendations were developed by provincial and Omineca Regional staff from FLNRORD. This is a broad, landscape-level assessment that "flags" areas where management attention may be warranted. Recommendations are provided in this report for further analysis or investigation that could be undertaken at the regional level to better understand the condition of grizzly bears and their habitat; this may be needed where:

- Proposed projects and activities are being considered in flagged areas; in these cases, decision makers are encouraged to discuss the proposed work with regional subject matter experts to better understand the potential cumulative impact of the new work on the existing landscape and discuss potential mitigation options.
- Strategic-level actions or planning activities are being considered to address impacts to grizzly bears and their habitats; in these cases, further analysis and investigation may provide additional information needed to inform management actions.

[19] Provincial subject matter experts have expertise in cumulative effects assessment and grizzly bear biology.

4.1 POPULATION RANK – CORE

Indicator Description

Assigns a conservation management concern rank for each GBPU in B.C. using the NatureServe ranking methodology (Master et al., 2012) and calculator.[20] Each GBPU is ranked to reflect the GBPU's population size and trend, genetic and demographic isolation, as well as threats to bears and their habitats (M1 to M5;[21] ranked highest to lowest conservation concern). This GBPU rank is extrapolated to the LU level based on the majority overlap with a GBPU. Landscape Units ≥50% within a GBPU are assigned the rank for that GBPU.

Interpretation Key

- High risk GBPUs (M1, M2, and M3) are flagged; management considerations are recommended when reviewing land-based decisions in these areas.

Benchmark

- Very Low (M5) and Low (M4) conservation concern (not flagged)
- Moderate (M3), High (M2), and Extreme (M1) conservation concern (flagged)

Management Context

Decisions related to population recovery planning.

Regional Commentary:

Conservation Concern Rankings

The Finlay-Ospika, Omineca, and Parsnip GBPUs are classified as Very Low conservation concern (M5), indicating that grizzly bear populations are at a lower risk in these GBPUs. The Moberly and Nulki GBPUs are classified as High conservation concern (M2), and the Nation and Robson GBPUs are classified as Moderate conservation concern (M3) and are flagged for management attention. These GBPUs flag for a variety of threats depending on circumstances within the area and the threats of primary concern are human disturbance, resource use, agriculture, residential development and isolation (e.g., caused by the Williston Reservoir).

Note that in the Population Rank map below (Figure 4.1), some LUs will appear as a different conservation rank than the rest of the GBPU. This is because the majority area of these LUs is outside of that GBPU; therefore, the LU is assigned the rank of the neighboring GBPU.

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***high*** *relevance and* ***moderate*** *precision*. Rationales for these rankings are described in Table 4.1 below.

[20] For additional information on the NatureServe Conservation Rank Calculator, visit https://www.natureserve.org/conservation-tools/conservation-rank-calculator

[21] Categories M4 and M5 replace the previous 'Viable' category and M1-M3 are analogous to the previous 'Threatened' category, where M1 requires the most urgent conservation management focus

Table 4.1 *Population Rank (Core) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	High	This is a highly relevant indicator for population status because it incorporates a wide variety of potential threats to grizzly bear populations into its ranking system.
Precision	Moderate	Some threat categories that feed into the ranking contain a higher level of uncertainty than others due to data quality or use of expert-based rather than empirical thresholds.

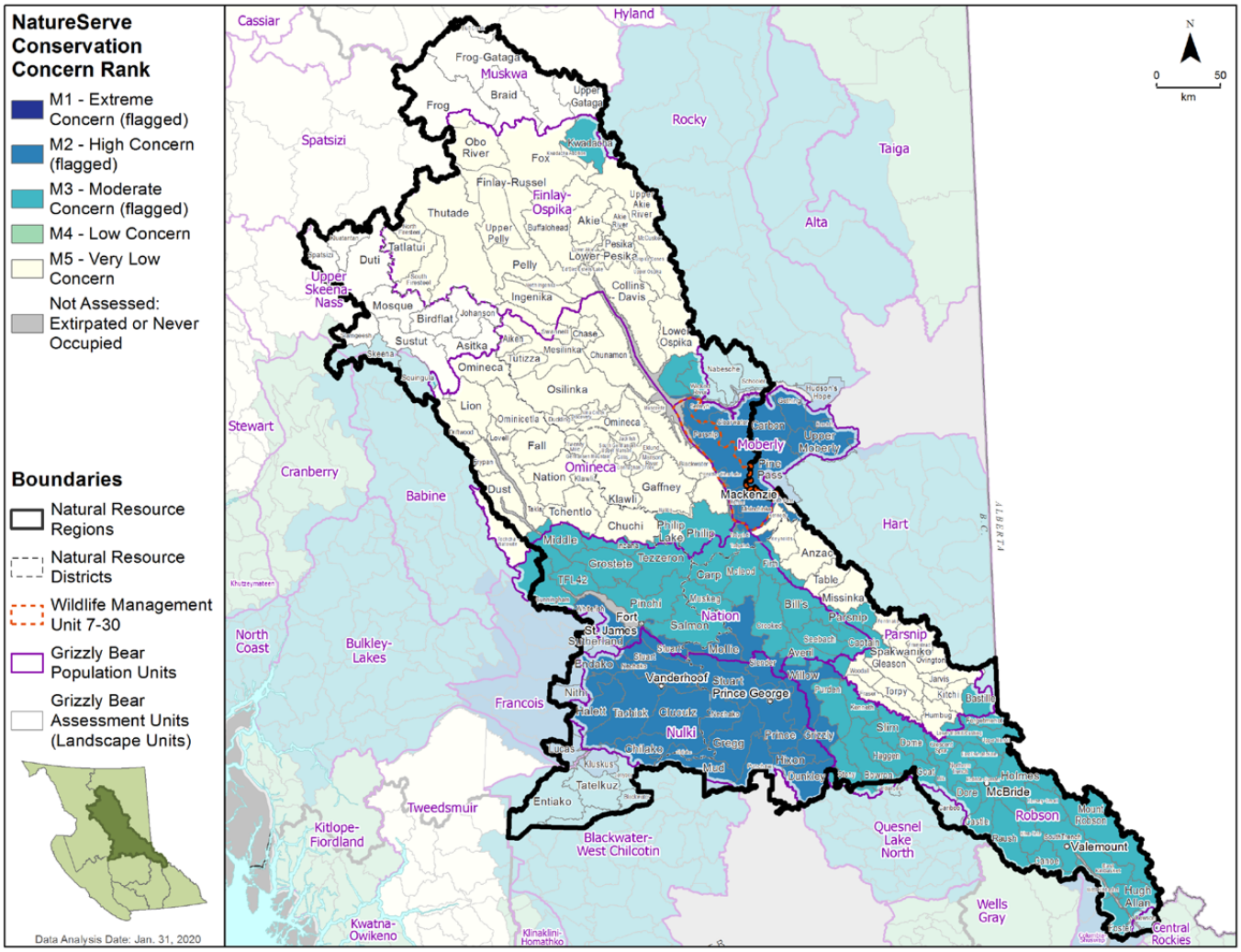

Figure 4.1 *Grizzly Bear Population Rank – Omineca Region*

4.2 NUMBER OF BEARS – SUPPLEMENTAL

Indicator Description

This indicator reports the estimated number of bears per 1000 km^2 from a regression model that extrapolates field-based population estimates to unsurveyed areas based on factors that drive grizzly bear population size including human intrusion and forage availability (Mowat et al., 2013). Bear densities are generated for GBPUs and LUs using the same regression model. Model-generated bear density estimates may have been revised based on local knowledge. This indicator is assessed at the LU level.

Interpretation Key

- Bear densities >10 bears per 1000 km^2 are lower risk.
- Bear densities <10 bears per 1000 km^2 are higher risk and are flagged; management considerations are recommended when reviewing land-based decisions in these areas.

Benchmark

- >10 bears per 1000 km^2 (not flagged)
- <10 bears per 1000 km^2 (flagged)

Management Context

Decisions related to population recovery planning, estimating historic range occupancy, estimating current population density, establishing licensed hunting allocations (when hunts were open), and conservation management.

Regional Commentary:

Bear densities within the Omineca Region are variable, resulting from the varied human disturbance, topography, terrain and habitat types across the region as it changes from pine-dominated plateaus to mountainous terrain (Figure 4.2). Bear densities are highest in the Parsnip, Robson, Finlay-Ospika and Omineca GBPUs, where the estimated grizzly bear density is >10 bears/1000 km^2 (Table 4.2). These GBPUs are currently considered to be lower risk for grizzly bears from a bear abundance perspective.

Portions of the Omineca, Moberly, Nation, and Nulki GBPUs have low bear density (<10 bears per 1000 km^2) driven by human presence in major communities (Prince George and Vanderhoof) and human activities that may have a negative effect on grizzly bear populations and habitat. Additionally, some areas of the region would likely have naturally occurring low densities of grizzly bears even without human activity, namely the Nation and Nulki GBPUs.

The regression model used to estimate bear density in interior ecosystems relies on several indicators including precipitation which is the main indicator of plant productivity and indexes of human activity. There are four field-based population inventories in the Omineca Region that provide direct population estimates.

Field-based trend or population inventory data may be warranted to develop appropriate mitigation measures and/or monitor the efficacy of mitigation measures implemented from incremental increases in human activity in an area.

As mentioned in Section 2.2, certain GBPUs within the Omineca Region overlap the administrative boundaries of other Natural Resource Regions. Since grizzly bears traverse these administrative boundaries, the management of grizzly bear populations and habitat is a cross-regional undertaking and should be coordinated in areas where grizzly bear populations are at a higher risk.

Table 4.2 *Population Unit Summary Table for the Omineca Region*

GBPU	Conservation Concern Ranking	Estimated Population[22]	Total GBPU Area (km²)[23]	Bear Density (bears per 1000km²)	% GBPU in the Omineca Region
Finlay-Ospika	M5 (Very Low)	971	29,960	32.5	100
Omineca	M5 (Very Low)	402	28,669	14.0	97
Moberly (7A portion)	M2 (High)	13	2,120	6.0	49
Nation	M3 (Moderate)	170	17,517	9.7	97
Nulki	M2 (High)	44	15,637	2.7	100
Parsnip	M5 (Very Low)	455	10,637	42.6	100
Robson	M3 (Moderate)	534	17,061	28.4	98

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***moderate*** *relevance and* ***moderate*** *precision*. Rationales for these rankings are described in Table 4.3 below.

Table 4.3 *Number of Bears (Supplemental) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	Moderate	Bear density as predicted by relative human activity and forage abundance is a moderately relevant indicator for population status.
Precision	Moderate	Although there are four field-based population estimates for grizzly bears in Omineca Region, most of the regional population estimates are developed by a regression model and thus carry a higher level of uncertainty relative to field-based estimates. Regardless, the estimate of grizzly bear population density only plays a moderate role in assessing threats and impacts from cumulative effects on the landscape.

[22] Population estimates were developed in 2018 using a regression model and field-based population inventory data where available (BC MFLNRORD, 2020). Each GBPU's population estimate is a point estimate (or derived from a point estimate) and although estimates are rounded to the nearest whole number, results should not be interpreted as precise to the nearest whole number. Rather, estimates should be interpreted as moderately precise as per Table 4.3 above.

[23] The total area excludes non-viable habitat such as water and ice (km²).

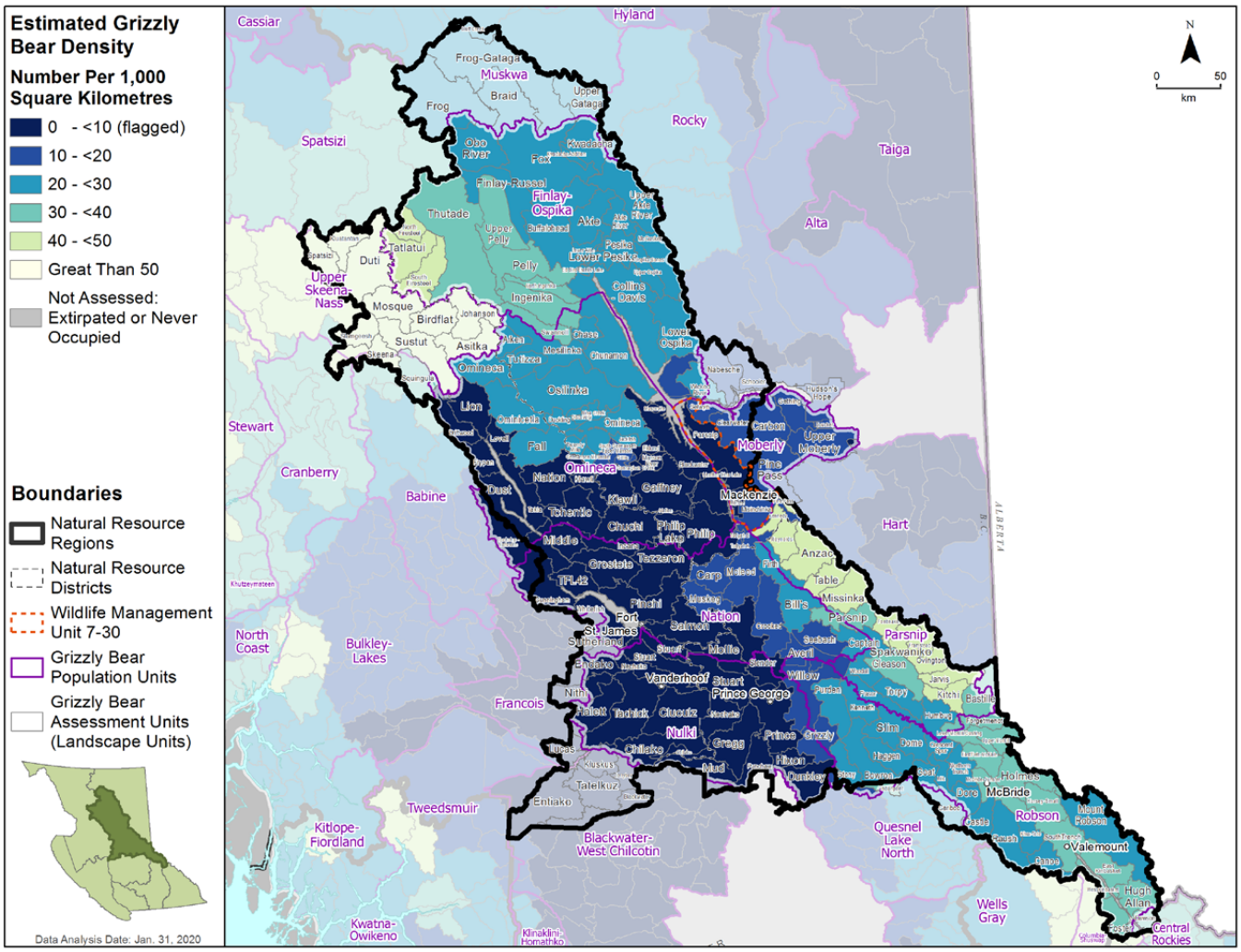

Figure 4.2 *Grizzly Bear Density – Omineca Region*

4.3 MORTALITY RATE – CORE

Indicator Description

This indicator reports the percent female mortality of the estimated total GBPU grizzly bear population compared against mortality reference points,[24] averaged over 2008 to 2017. Estimates are derived from provincial population estimates, data from the Compulsory Inspection Database [CID]), and provincial estimates of un-reported mortality.[25] Results are extrapolated to the LU level, where LUs are assigned a pass or fail depending on overlap (<10%) with a failed mortality polygon.

Interpretation Key

- Female mortality >1.33% is flagged as a potential risk to grizzly bears

Benchmark

- 0 to 1.33% = Negligible Risk
- 1.33 to 2% = Moderate-Low Risk
- 2 to 3.33% = Moderate Risk
- Above 3.33% = High Risk

Management Context

Any relevant land use decision that could impact mortality for grizzly bears, including access, regulating all hunters, education, presence of conservation officers, etc.

Regional Commentary:

Humans are the main cause of grizzly bear mortality, including human-bear conflicts, poaching, and collisions with vehicles and trains.[26] In the CID, reported mortalities fall into six categories: animal control (to address human-bear conflicts), pick-ups (grizzly bears found dead with cause of death unspecified), road kills, rail kills, non-licensed hunting and licensed hunting (note that the licensed grizzly bear hunt was closed in 2017).

High risk (>3.33%) LUs are located within the Moberly and Nulki GBPUs (Figure 4.3) occurring in close proximity to communities including Vanderhoof and Mackenzie. This concentration of unsustainable mortality is likely a cumulative effect of multiple types of human-caused mortality given the adjacency to human settlement, roads, and industrial activities including forestry, agriculture, oil and gas exploration, pipelines, mines, and associated road and rail networks. Industrial roads (and permanent corridors) are also the primary means for hunters, trappers, and recreation enthusiasts to access the backcountry, which may also lead to negative effects on grizzly bear populations and habitat through direct mortality and displacement from quality habitats.

Moderate risk (2-3.33%) is shown to occur in a series of LUs in the northern portion of the Nation and west and southeastern portions of the Omineca GBPUs, along with a grouping of six LUs in the Robson GBPU. This moderate level of female mortality is likely driven by presence of humans using road networks.

[24] B.C. uses 4-6% as the range of mortality for interpreting population risk (1.33 to 2% female), with the higher values associated with units verified to have higher recruitment rates.

[25] Mortality limits for each Fish & Wildlife region are established using the BC Government's Grizzly Bear Harvest Management Procedure (BC MWLAP, 2004a). Mortality limits include known mortalities plus an estimate of unknown human-caused mortalities.

[26] In December 2017, the BC Government announced a provincial ban on grizzly bear hunting (other than hunting by First Nations for food, social and ceremonial purposes). This decision will affect future management of grizzly bear populations given that hunting is traditionally accounted for the majority of the mortality in the province.

It is not anticipated that female mortality limits will continue to be exceeded since the licensed grizzly bear hunt has closed. However, if the licensed hunt re-opens, it will be important to look at where managers intervened on harvest opportunities in the past to remain below bear mortality limits.[27] These areas may have higher risk to bear populations and therefore warrant management attention when considering land use proposals.

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***moderate*** *relevance and* ***moderate*** *precision*. Rationales for these rankings are described in Table 4.4 below.

Table 4.4 *Mortality Rate (Core) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	Moderate	This is a moderately relevant indicator for population viability as populations are driven by presence of reproductive females. The CID is a good database to monitor and report grizzly bear mortality and provides relevant information for this assessment. With the closure of the licensed hunt, this indicator is only relevant where human-bear conflicts occur. If the hunt re-opens, this indicator will increase in relevance.
Precision	Moderate	Mortality rates are calculated based on population estimates which carry uncertainty. With the removal of the licensed grizzly bear hunt, the relevance of this indicator decreased as the majority of mortalities in Omineca Region were hunt-based.

[27] During the licensed hunt, harvest managers were able to adjust the grizzly bear hunting opportunity to minimize the chance that mortality limits were exceeded (e.g., reduce LEH authorizations or quotas in particular areas if mortality rates were approaching limits).

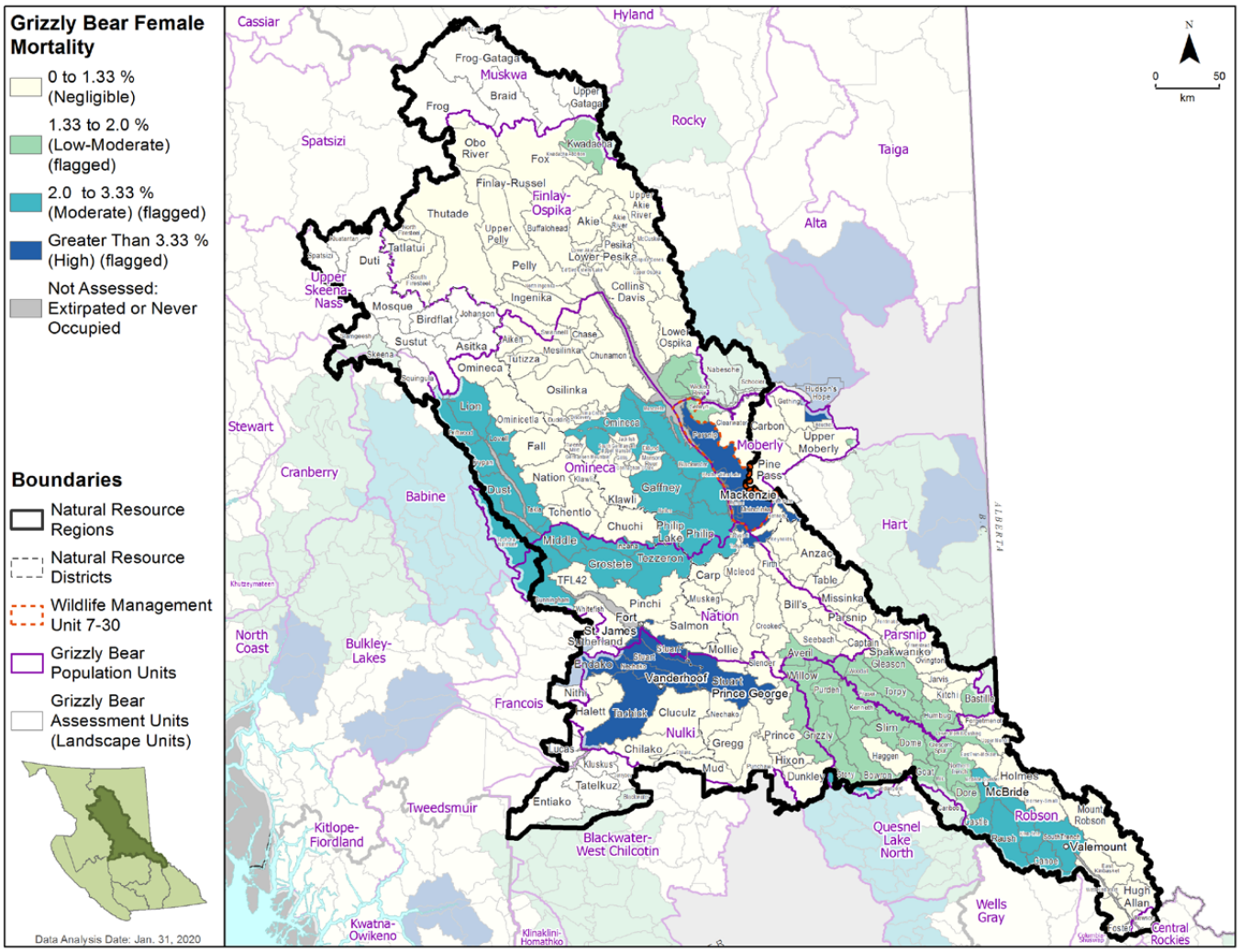

Figure 4.3 *Female Mortality Rate – Omineca Region*

4.4 ROAD DENSITY – SUPPLEMENTAL

Indicator Description

This indicator reports total length of open roads[28] (as well as pipeline corridors, transmission line rights-of-way, and rail lines) divided by total LU area (km/km^2). Most grizzly bear deaths occur within 500 metres of a road or other corridor, and are the result of human-bear conflicts, poaching, or collisions with vehicles and trains.[29] Furthermore, as road density increases, displacement from key habitats near roads increases, leading to habitat loss, fragmentation and potential loss of access to key food sources, and ultimately to decline of grizzly bear populations.

Interpretation Key

- Classes 0, 1 and 2 pose a lower risk to grizzly bears and are not flagged
- Classes 3, 4, 5, 6 and 7 pose a higher risk to grizzly bears and are flagged for management attention[30]

Benchmark

- Road Density >0 and Coastally Disconnected
- Class 0= 0 km/km^2 (Roadless)
- Class 1= 0.01-0.3 km/km^2 (Low)
- Class 2= 0.31-0.6 km/km^2 (Moderate)
- Class 3= 0.61-0.75 km/km^2 (High)
- Class 4, 5, 6 & 7= >0.75 km/km^2 (Very High)

Management Context

Managing human access (road densities and road closures), managing attractants (e.g. hydro and pipeline right-of-ways, dumps), camp management, access to salmon, hunter regulation, and minimizing bear mortality from negative encounters with humans.

Regional Commentary:

For most regional assessments in B.C., risks to grizzly bear populations and habitat correlate more with road density than any other indicator. Primarily, areas with high road density are avoided by grizzly bears as it leads to habitat loss and fragmentation and increased chance of direct mortality (Proctor et al., 2018). Areas with low road density are more favourable for grizzly bears and can attract them due to roadside seeding, linear movement corridors, and increased prey availability.

Conflicts still occur between bears and humans in low road density areas and may result in bear mortality. Most grizzly bear mortality from human encounters occurs within 500 metres of a road. As road density increases, it leads to habitat loss and fragmentation, population isolation, and population decline over time.

Nine LUs within the Finlay-Ospika GBPU have been assessed as roadless and therefore do not pose risk to grizzly bears from a road density perspective. Other LUs in the Finlay-Ospika, Moberly, Parsnip and Robson GBPUs vary from low (Class 1) to high (Class 3) road density ratings. Although the LUs in Class 1 and 2 are not flagged for management attention at this time, it is important to acknowledge that a temporal disturbance along these road networks is present which has the potential to have negative effects on grizzly bears now and in the future.

[28] Note that this indicator does not include roads that are permanently deactivated or closed to access.

[29] FFor more information on the science informing this indicator, please refer to the Interim Assessment Protocol for Grizzly Bear in British Columbia, V1.2 (BC MFLNRORD & BC MOECCS, 2020).

[30] Classes 3 through 7 have been further split into four sub-classes to provide more detailed information on road density to facilitate in communicating risk within sensitive high risk LUs.

The highest road densities occur in the Nation, Nulki, Omineca, Robson and Parsnip GBPUs. LUs that are flagged as >0.75 km/km^2 correlate directly to major highways in the region, including Highways 97, 16, 39 and 27, areas of high forestry activity and associated resource roads, and human settlement around communities including Prince George, Vanderhoof, Mackenzie and Valemount.

Apart from major highways and communities that currently exist in the Omineca Region, road density is largely influenced by the topography which drives the presence or absence of resource extraction and human use (i.e., road densities tend to be lower in areas with more mountainous landscapes as road development for resource use is costly).

It is important to note that this indicator treats all roads in the spatial layer as being equal; that is, an in-block road that has grown over and is largely only accessible on foot is treated equally in the road density calculation as is a forest service road graded for travel at 80km/hour. Recognizing the displacement that still may occur from human activity on in-block roads, regional experts support the results from this indicator as they relate to predicted influence on grizzly bear population trends.

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***high*** *relevance and* ***moderate*** *precision*. Rationales for these rankings are described in Table 4.5 below.

Table 4.5 *Road Density (Supplemental) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	High	There has been significant research linking road density to grizzly bear population trends which makes the road density indicator highly relevant and this anecdotally appears to hold true in Omineca Region.
Precision	Moderate	The Provincial road inventory is generally a good indicator of road density but does not update road status as roads become deactivated or grown over to become impassible and thus leaves some uncertainty in local-scale impacts of roads on grizzly bears.

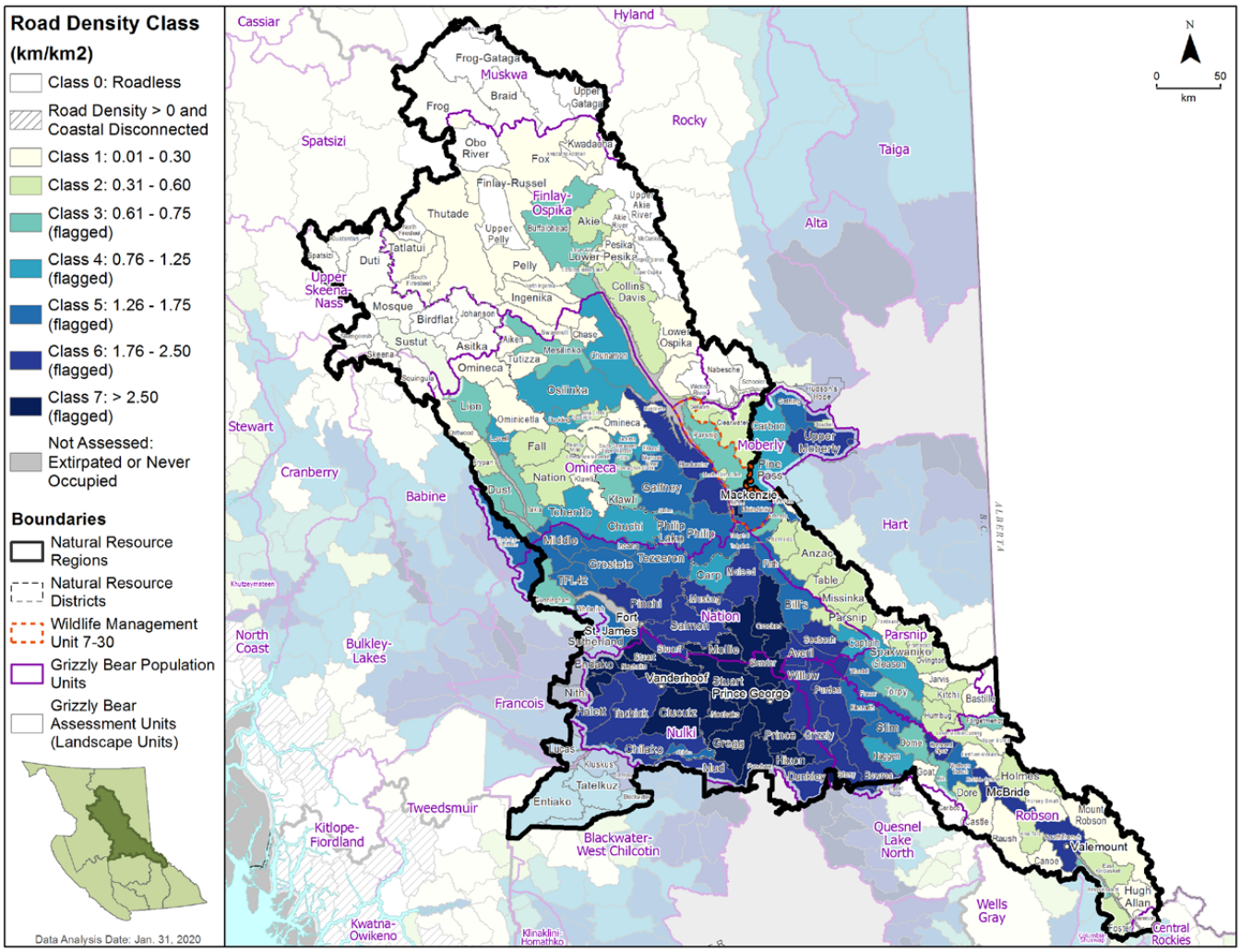

Figure 4.4 *Road Density – Omineca Region*

4.5 CORE SECURITY AREAS – CORE

Indicator Description

This indicator reports the prevalence of core security areas, which are patches of habitat greater than 10 km^2 within an LU with minimal likelihood of human use. These areas are large enough to accommodate a female grizzly bear's daily foraging requirements in areas with an absence of roads, settlement areas, recreation areas, industrial areas. To adequately buffer grizzly bears from humans, these core security areas must be 500 metres or more from human infrastructure and activity.[31]

Interpretation Key

- LUs with more than 60% of the area in core security areas pose a lower risk to grizzly bears.
- LUs with less than 60% of the area in core security areas pose a higher risk to grizzly bears and are flagged for management attention.

Benchmark

- ≥ 60% capable core[32] (not flagged)
- < 60% capable core (flagged)

Management Context

Managing human access, managing attractants (e.g., hydro line ROWs and pipeline corridors, dumps, camp management, access to salmon, hunter regulation for managing ungulate kills, etc.), minimizing bear mortality resulting from negative encounters with humans, and hunter education and regulations.

Regional Commentary:

Core security areas for grizzly bears in the Omineca are best represented in the north and southeastern portions of the region, particularly in the Finlay-Ospika, Moberly, Parsnip GBPUs and in the southern part of the Robson GBPU. These areas contain significant portions of mountainous and steep terrain that have little to no human settlement or roads and a general lack of industrial development. This low level of human access results in more core security areas for grizzly bears.

The Nulki, Nation, southern portion of the Omineca, and northwestern portion of the Robson GBPUs all contain a deficit of core security. This is a result of the prevalence of human infrastructure and activity in these areas. These GBPUs encompass urban and agriculture areas and contain industrial roads and infrastructure associated with forestry. Industrial roads (and permanent corridors) are the primary means for hunters, trappers, and recreation enthusiasts to access the backcountry.

This indicator denotes areas where grizzly bears can live with reduced chance of human interaction. Further analysis to inform management decisions could include:

- Assessing the amount and quality of forage in these core security areas. A core security area with low forage availability is not as valuable as a core secure area with high forage availably. Future developments and human activity should be especially avoided in core security areas with available forage.

[31] 500 meter buffers on select human disturbance are excluded from Secure Core: mining & extraction, oil & gas, utility ROWs, agricultural, urban, urban mixed, recreation (see Appendix II tab 'meta Disturbance') or Appendix III of the Interim Assessment Protocol for Grizzly Bear in British Columbia (BC MFLNRORD & BC MOECCS, 2020).

[32] Capable core is areas without rock, ice and lakes that grizzly bears do not use and are away from human presence and activities.

- Assessing where non-core security areas overlap key forage availability to focus restoration/ road reclamation efforts to increase the availability of core security habitats with forage. Future developments and human activity should be avoided in these areas if restoration activities occur.

The benchmark of 60% core secure area is based on science and policy from other jurisdictions which recommend that secure habitat constitutes 68-84% of an average female home range for long-term stability (Gibeau et al., 2001). In addition, the Yellowstone and Northern Continental Divide Ecosystem conservation plans apply the objective of no less than 60% core security in any one bear management unit to support recovery of grizzly bear populations. Further investigation into this indicator could include proportions of secure habitat and spatial distribution metrics with linkages to key population parameters like population trend, survival rates and reproductive rates. For simplicity, the data is summarized here as a proportion of a LU that has core security areas and does not consider linkages to population trends or spatial arrangement of core security areas.

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***high*** *relevance and* ***moderate*** *precision*. Rationales for these rankings are described in Table 4.6 below.

Table 4.6 *Core Security Areas (Core) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	High	There has been significant research linking road density to grizzly bear population trends. Because this core security indicator is driven by road density, the core security indicator is highly relevant, and this anecdotally appears to hold true in Omineca Region.
Precision	Moderate	The Provincial road inventory that drives the core security indicator is generally a good indicator of road density but does not update road status as roads become deactivated or grown over to become impassible and thus leaves some uncertainty in local-scale impacts of roads on grizzly bears.

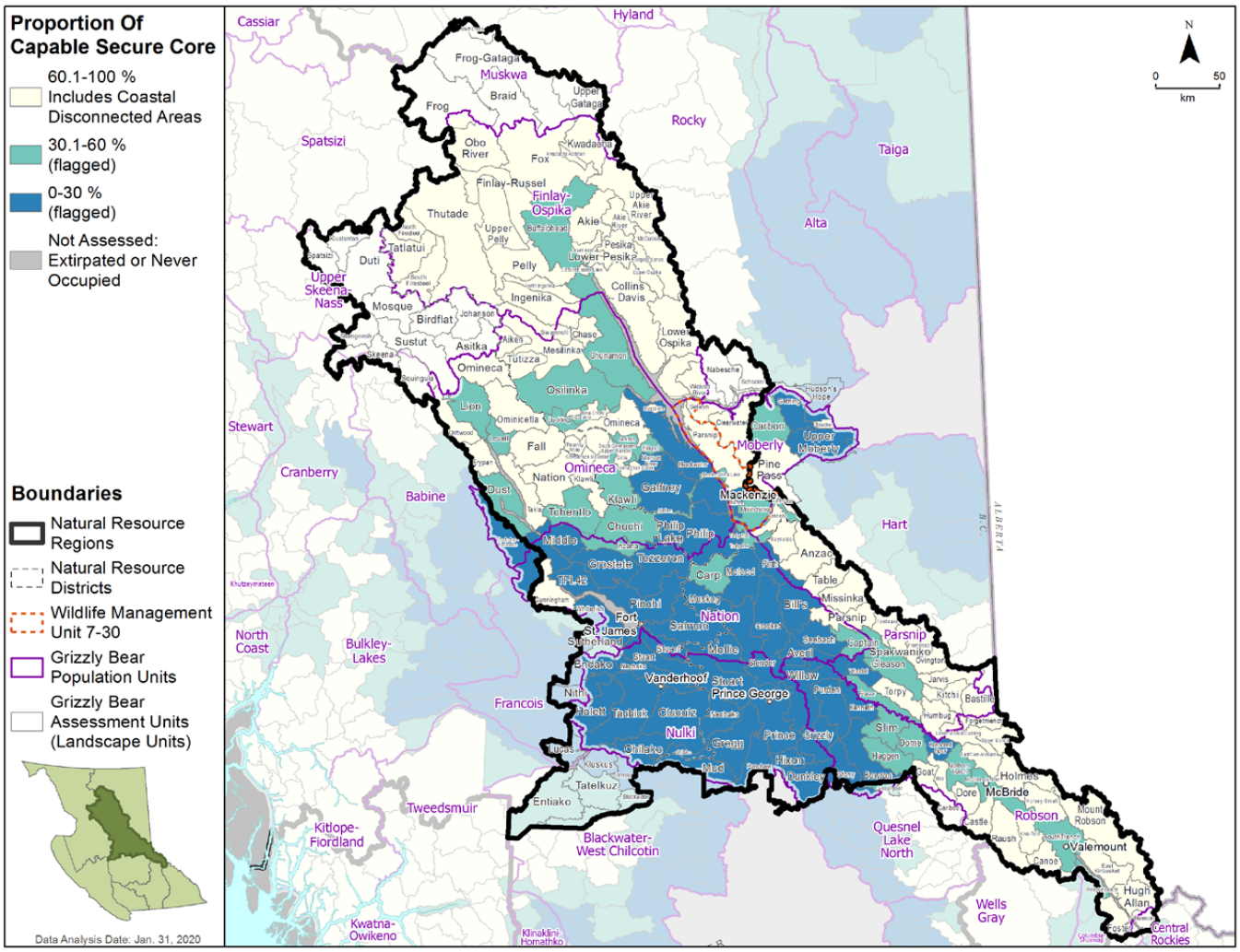

Figure 4.5 *Core Security Area – Omineca Region*

4.6 FRONT COUNTRY – CORE

Indicator Description

This indicator reports the proportion of each LU that is considered front country. Front country includes urban and rural landscapes that may contain both relatively high human density and access, and grizzly bear attractants in the form of livestock, livestock carcasses, livestock feed, fruit trees, human food/garbage and grain. This indicator includes areas of human settlement (including communities and agricultural areas) as well as high use rural roads (roads up to two hours travel time from cities).

Interpretation Key

- LUs with less than 20% of the area in front country are lower risk to grizzly bears.
- LUs with more than 20% of the area in front country are higher risk to grizzly bears and are flagged for management attention.

Benchmark

- ≤ 20% Front country (not flagged)
- > 20% Front country (flagged)

Management Context

Front country decisions related to managing attractants (hydro lines, pipeline right-of-ways, dumps, camp management, access to salmon, hunter regulation for managing ungulate kills, etc.), education for private land, managing human access, managing livestock attractant and areas, and backcountry decisions related to managing attractants, major project permits, and reducing human-bear encounters/mortality.

Regional Commentary:

Front country is an important zone of interface between humans and grizzly bears. These areas have relatively high human density or use and contain attractants for grizzly bears (e.g., livestock, livestock carcasses and feed, grain crops, fruit trees, and human food and garbage). As such, the likelihood of conflicts and consequent risk of bear mortality in the front country is high.

Areas with high levels of front country correlate closely with areas of core security deficit (Figure 4.5). GPBUs in the southern portion of the Omineca Region contain the greatest proportions of front country as these areas are more highly populated, encompass more agricultural land, and are highly roaded. The highest percentages of front country are found in Nulki, Nation, and Robson GBPUs, as well as the southern sections of the Moberly and Omineca GBPUs. LUs in these areas are flagged for management attention.

GBPUs with the lowest proportion of front country are generally found in the northern portions of the region, specifically in the Finlay-Ospika GBPU and in the northern end of Omineca GBPU. The Parsnip GBPU also contains a low percentage of front country due to limited access. However, access into previously non-roaded areas is increasing annually.

Additional analysis with respect to this indicator could incorporate information on road accessibility based on regional knowledge. Provincial spatial data on roads in the region likely differs from the actual use of roads within the region and is contributing to discrepancies in the indicator results. For instance, regional experts are aware that the access road to Kemess Mine is graded for higher speeds than the provincial spatial data indicates, which results in an underestimation of front country in this area.

It is important to note that the benchmark of 20% front country area used here is an expert-based benchmark. This benchmark is used to indicate where there could be concerns and further investigation may be warranted to determine if management actions is needed. Further investigation into this indicator could include proportions of secure habitat and spatial distribution metrics with linkages to key population parameters like population trend, survival rates, and reproductive rates. For simplicity, the data is summarized here as a proportion of a LU that has front country areas and does not consider linkages to population trends or spatial arrangement of core security areas.

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***high*** *relevance and* ***moderate*** *precision*. Rationales for these rankings are described in Table 4.7 below.

Table 4.7 *Front Country (Core) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	High	Grizzly bear mortality risk increases with increasing interaction with humans and the front country indicator depicts the amount of front country as a risk factor for grizzly bears across the Omineca Region. Because of the strong link between human activity and bear mortality, this indicator has high relevance.
Precision	Moderate	The Provincial road inventory that drives the front country indicator is generally a good indicator of road density but does not update road status as roads become deactivated or grown over to become impassible and thus leaves some uncertainty in local-scale impacts of roads and associated human activity on grizzly bears.

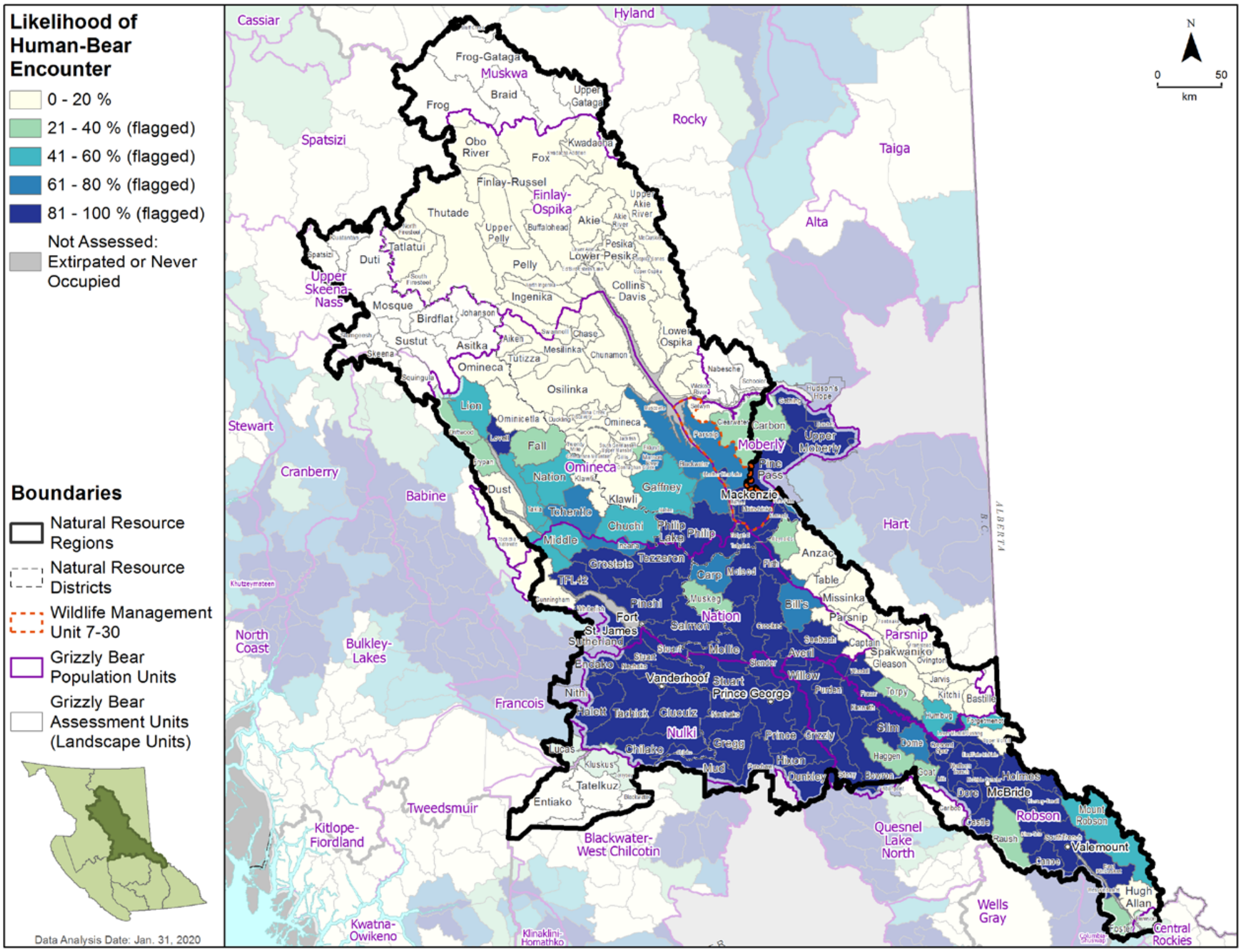

Figure 4.6 Front Country – Omineca Region

4.7 HUNTER DAY DENSITY – CORE

Indicator Description

This indicator reports average annual hunter day density, which is the number of hunter days over a five-year period (2013-2017) per year for the occupied portion of the management unit (MU).[33] This density is extrapolated to the LU level (days/km^2). Hunter density can influence the amount of bear mortality due to the potential for lethal encounters with grizzly bears.[34] Hunters targeting ungulates or other wildlife may encounter a grizzly bear or have a grizzly bear approach their kill, resulting in a grizzly bear mortality. LU average hunter day density is divided into statistical quartiles for the current assessment – quartiles are not equal.

Interpretation Key

- Average annual hunter days of 0 – 0.65/km^2 are lower risk to grizzly bears
- Average annual hunter days of 0.65 – 1.87/km^2 are moderate risk to grizzly bears.
- Average annual hunter days greater than 1.87/km^2 are higher risk to grizzly bears and are flagged for management attention.

Benchmark

- LU average hunter day density is divided into statistical quartiles for the current assessment – quartiles are not static
- Low= Quartiles 1 & 2 (0 – 0.65 hunter days/km^2) (not flagged)
- Moderate= Quartile 3 (0.66 – 1.87 hunter days/km^2) (not flagged)
- High= Quartile 4 (>1.87 hunter days/km^2) (flagged)

Management Context

Minimizing bear mortality resulting from negative encounters with hunters.

Regional Commentary:

Various LUs throughout the Omineca Region are flagged based on hunter density as a risk to direct grizzly bear mortality. The majority of LUs ranked as high risk to grizzly bears for this indicator occur within the Nation and Nulki GBPUs. Both of these GBPUs are located in the southern portion of the region where the majority of settlements and road access occur. In addition, a number of LUs are flagged in the Robson and Parsnip GBPUs.

In contrast, the Finlay-Ospika, Moberly, and Omineca GBPUs are not flagged for management attention as these GBPUs have relatively minimal access and are far from major urban centres. However, a number of LUs within the Moberly, Parsnip and Omineca GBPUs are close to the threshold for being flagged and should be further investigated.

[33] Note that this indicator reflects activity of **all hunters**, not just grizzly bear hunters, because it captures the direct mortality risk to grizzly bears caused by people on the landscape with firearms who may kill a bear in a conflict situation or incidental to hunting other species.

[34] The effect of ungulate hunters on grizzly bear mortality has been documented (Haroldson et al., 2004).

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***high*** *relevance and* ***high*** *precision*. Rationales for these rankings are described in Table 4.8 below.

Table 4.8 *Hunter Day Density (Core) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	High	The risk of bear mortality increases as the number of hunters on the landscape increases through conflicts with hunters and their harvested ungulates or intended mortality when the licensed grizzly bear hunt was open. This indicator is a good measure of relative mortality risk from conflict encounters.
Precision	High	The hunter day metric is calculated from the Hunter Sample Survey, which is relatively accurate in generating estimates of hunter harvest and effort.

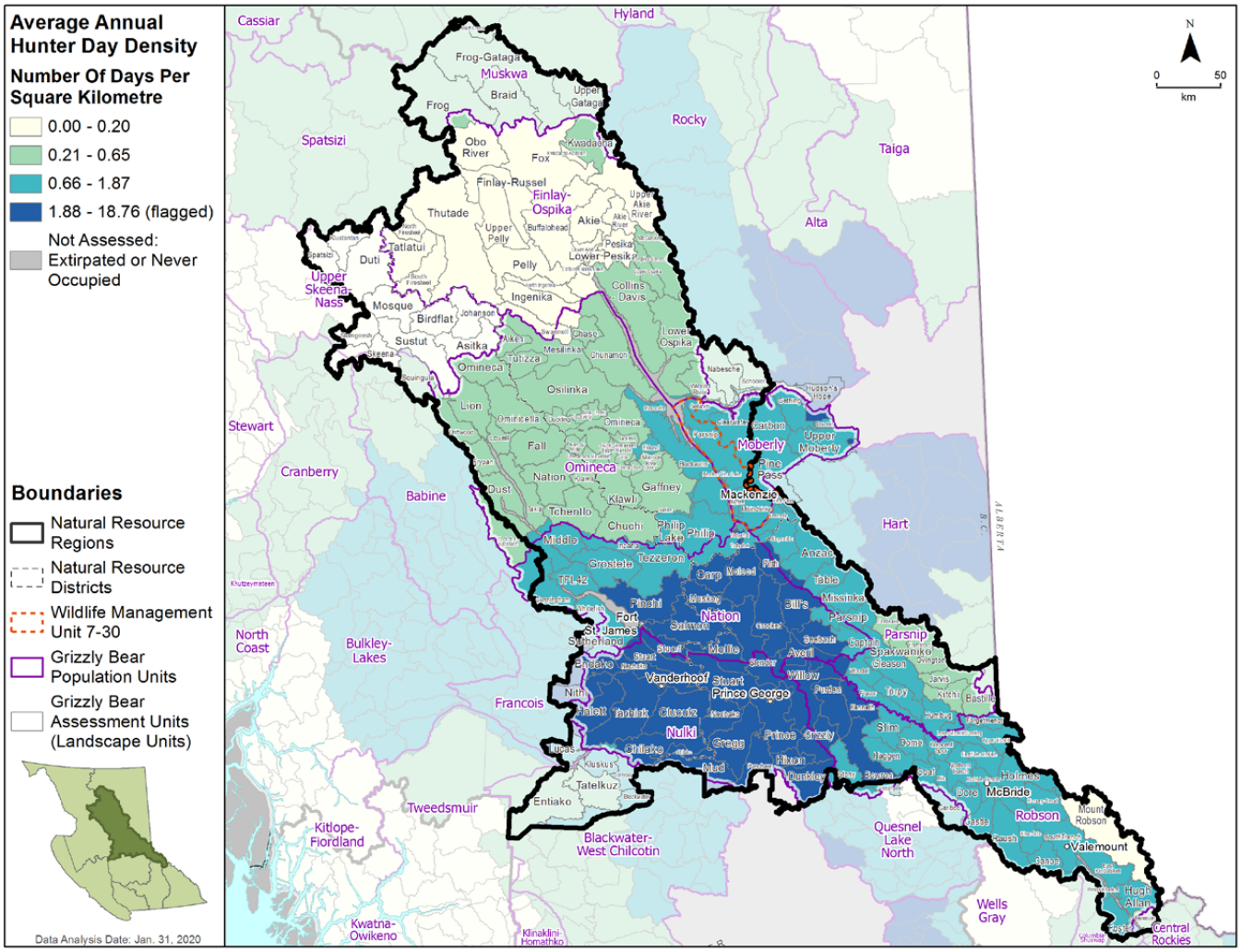

Figure 4.7 *Hunter Day Density – Omineca Region*

4.8 POOR FORAGE POTENTIAL (BEC MID SERAL DENSE CONIFER) – CORE

Indicator Description

This indicator reports the amount of mid-seral[35] dense conifer forest (by BEC zone) within each LU to represent areas that are **sub-optimal** for forage production for grizzly bears. Open canopy forests support greater berry production, which is an important food source for grizzly bears. Ultimately, this indicator flags potential seral stage imbalances at the landscape level that could be rectified (through management responses) to create more optimal conditions for grizzly bear forage production.

Interpretation Key

- LUs with less than or equal to 30% of area in mid-seral dense conifer are low risk to grizzly bears.
- LUs with more than 30% of area in mid-seral dense conifer are high risk to grizzly bears and are flagged for management attention.

Benchmark

- Low Risk= Mid-Seral Dense Conifer ≤ 30% in High or Moderate BEC zones (or Low sensitivity BEC Zone) in a LU
- High Risk= Mid-Seral Dense Conifer > 30% for select BEC Zones in a LU
- Insufficient Data= VRI gap ≥ 10% of BEC Zone in LU

Management Context

Managing forage supply (e.g., Timber Supply Review, silviculture, etc.) and meeting specific mid-seral objectives in timber supply areas.

Regional Commentary:

Optimal forage supply for grizzly bears is associated with mature, open-canopy, mixed forests, alpine meadows, avalanche slopes, and high-elevation regenerating burns that yield high berry density. The Omineca Region consists of a wide variety of forest types with different tree species such as white and black spruce, lodgepole pine, and aspen.

Areas with sub-optimal forage supply for grizzly bears are limited to a few LUs in the Finlay-Ospika, Nation and Nulki GBPUs. This is likely a result of lower resource use and natural disturbance regimes in the Finlay-Ospika and from temporally clumped salvage logging in the Nation and Nulki GBPUs.

The abundance of mid-seral as an index of grizzly bear forage availability is a coarse index of forage potential. Further investigation and analysis related to this indicator could include:

- Investigating the temporal variation in early-seral forests to determine which LUs will reach the mid-seral threshold in the next 10 years.
- Looking at the spatial arrangement of these flagging mid-seral polygons to provide decision-makers a finer scale for consideration in their decisions.
- Using regional expertise to determine why indicator status for some LUs varies from regional knowledge (i.e., if a LU is not flagging and there is a regional expectation that it should flag or be very close to flagging, further investigation should be undertaken).

[35] Mid-seral dense conifer forests are typically 40 to 100 years old depending on the ecosystem (BC MF & BC MELP, 1995).

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***moderate*** *relevance and* ***low*** *precision*. Rationales for these rankings are described in Table 4.9 below.

Table 4.9 *Poor Forage Potential (BEC Mid-Seral Dense Conifer) (Core) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	Moderate	This indicator is moderately relevant as its related to seasonally important food sources (e.g., spring vegetation and berries). Forage constraints are a real concern for grizzly bears especially in areas with relatively homogeneous forest ages resulting from forestry activity.
Precision	Low	There is uncertainty as to whether mid-seral accurately tracks forage constraints across the landscape resulting in low precision for this indicator.

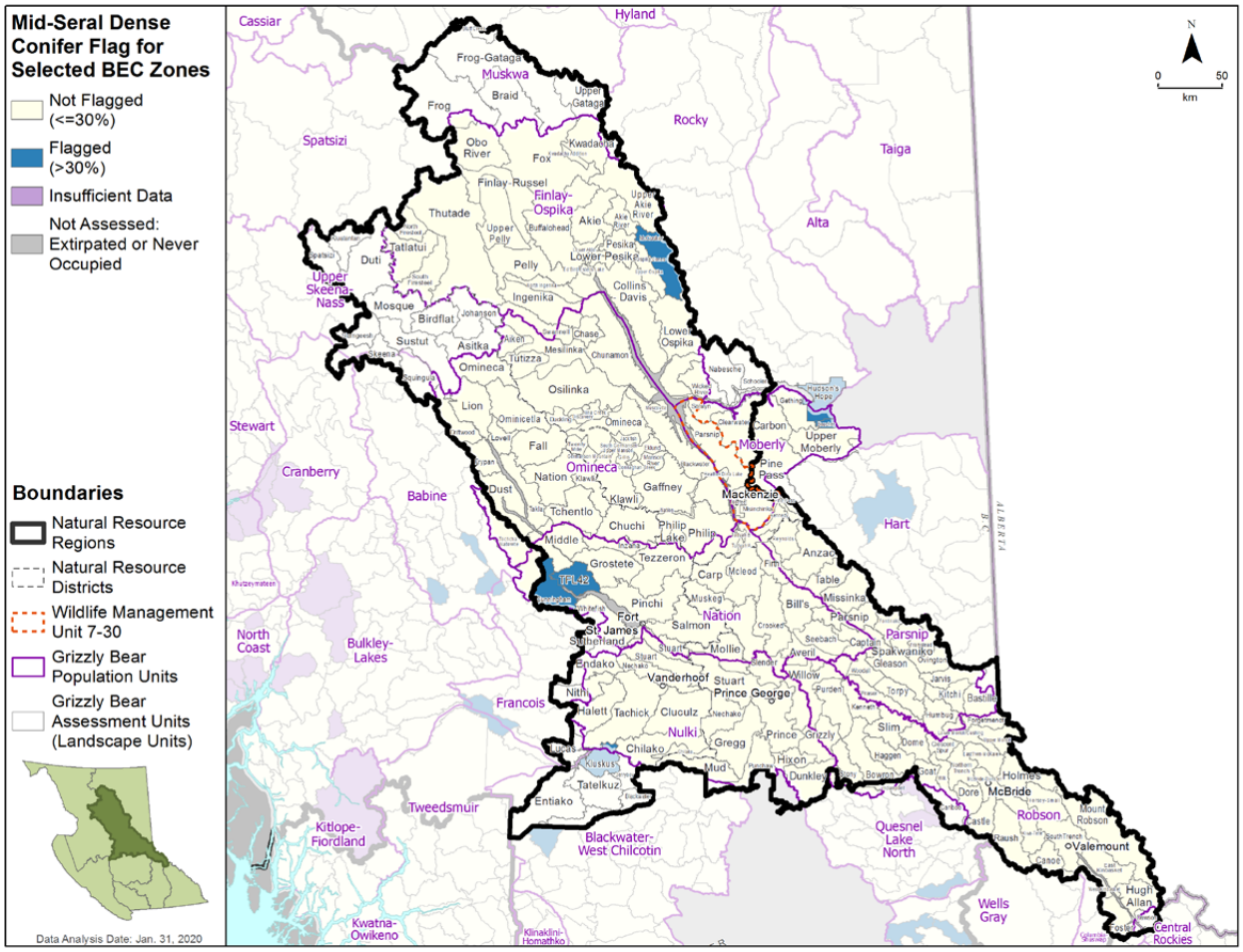

Figure 4.8 *Poor Forage Potential (BEC Mid-Seral Dense Conifer) – Omineca Region*

4.9 QUALITY FOOD – SUPPLEMENTAL

Indicator Description

This indicator assesses the amount of quality food sources available to grizzly bears. Quality food is considered present when >50% of LU is high or very high habitat capability ecosystems (BEI or EBM)[36] and/or any unit has >10,000kg salmon biomass.

Interpretation Key

- Quality food is considered present if:
  - >50% of the LU is classified as high or very high capability BEI, indicating presence of quality forage plants (EBM Classes 2 and 1, respectively), or
  - >10,000 kg of salmon is available at all time periods (sum of salmon kg by LU).

Benchmark

- Yes – high salmon or high capability
- No – not high salmon or high capability

Management Context

Conservation management.

Regional Commentary:

There is a predicted lack of quality food in many areas of the Omineca Region, notably in most of the Finlay-Ospika, Omineca, Nation and Nulki GBPUs (Figure 4.9).

Quality food is predicted to exist in minor portions of the Finlay-Ospika, Omineca, Nation and Nulki GBPUs and in much of the Parsnip, Robson and Moberly GBPUs. This is likely the result of varied topography, terrain and weather across the Omineca Region. Additionally, salmon biomass >10,000 kg exists along the western portions of the Finlay-Ospika, Omineca, Nation and Nulki GBPUs (Figure 4.10).[37]

Further analysis and investigation into this indicator could include:

- Running the analysis using a suitability indicator to demonstrate the availability of quality foods in the current forest state (BEI is a capability assessment which predicts how good an area can be for bear foods if it was in its most appropriate state, not current forest state).
- Refining the definition of quality foods through diet analysis (isotope) of existing grizzly bear hair samples and relate the indicator thresholds to the prevalence of those foods in bear diets. This step may also provide some insight into a minimum amount of salmon that must be available to be considered a key food source (e.g., is the 10,000kg cut-off appropriate?).
- Adding information to the salmon data layer to include an adjustment for salmon availability that reflects stream features that influence bears' ability to utilize spawning salmon (i.e., high amounts of spawning salmon might be present in a stream but if the stream is too deep to be fishable by bears, those salmon are not truly available to bears).
- Re-run the analysis every five years to incorporate the effect of continued declines in salmon availability.

[36] Grizzly bear habitat suitability mapping was completed by the Ecosystem-based Management Working Group as part of the planning initiative for the Great Bear Rainforest Land Use Order (Horn et al., 2009).

[37] Salmon availability averaged annually using Fisheries and Oceans Canada NuSEDS data (Fisheries and Oceans Canada, 2014).

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***moderate*** *relevance and* ***low*** *precision*. Rationales for these rankings are described in Table 4.10 below.

Table 4.10 *Quality Food (Supplemental) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	Moderate	The availability of seasonally important foods is critical in maintaining grizzly bear populations. Because vegetative forage is depicted as habitat capability, it does not necessarily represent current forage availability for bears. As such, this indicator is of moderate relevance. Relevance could be increased if some recommendations above are enacted.
Precision	Low	**Vegetation:** The use of BEI capability reflects the forage potential across the landscape but does not illustrate current state of forage availability thus creating a good deal of uncertainty on actual forage availability. **Salmon:** There are some uncertainties and data gaps with the salmon escapement data that is used.

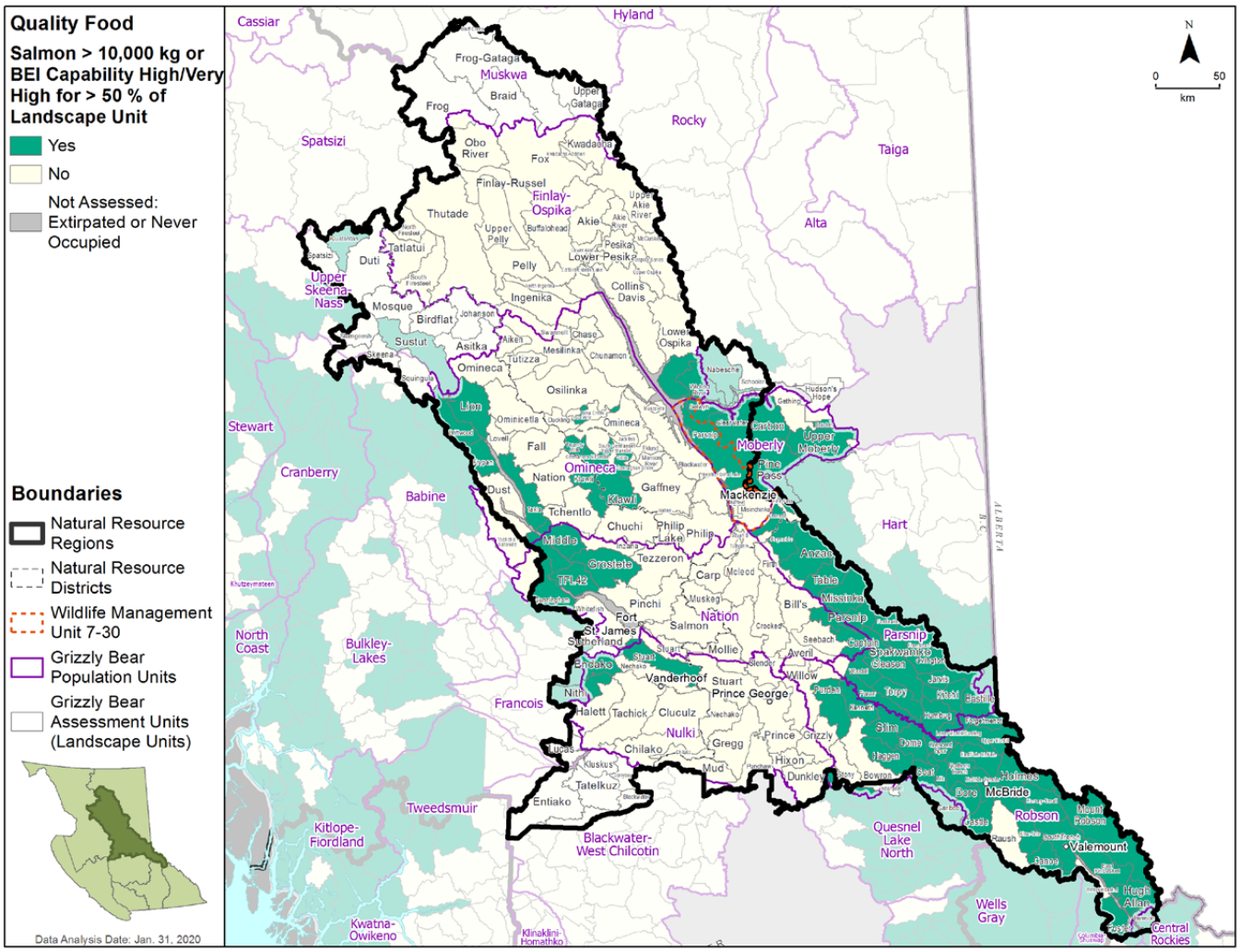

Figure 4.9 *Quality Food – Omineca Region*

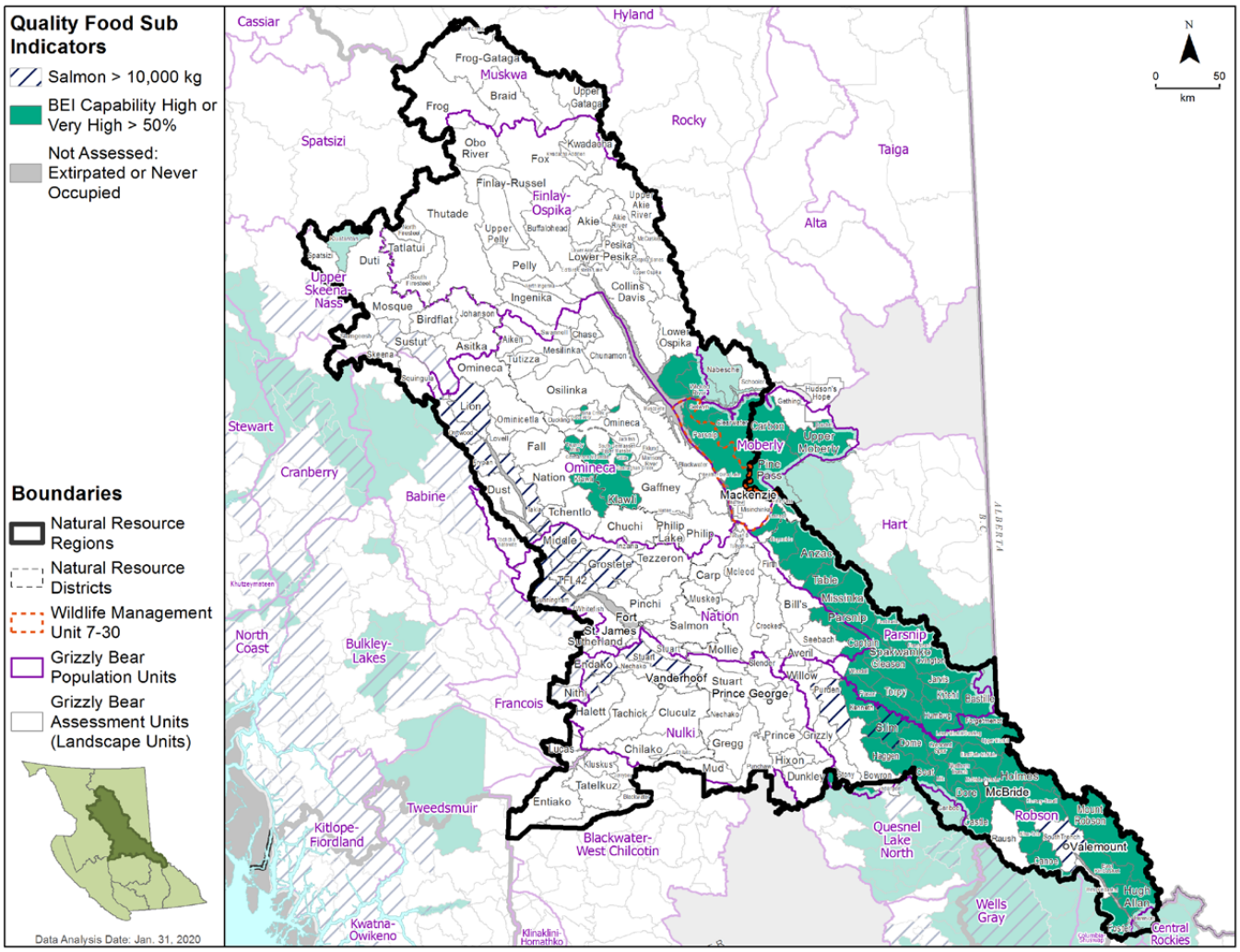

Figure 4.10 *Quality Food (Salmon Biomass and BEI Capability Separated) – Omineca Region*

4.10 HABITAT PROTECTION – SUPPLEMENTAL

Indicator Description

Habitat protection has two indicators:

- Indicator 1: Percent of total area of very high and high grizzly bear habitat capability (BEI or EBM) in a LU captured within conservation areas and other designations.[38]
- Indicator 2: Presence/absence of Grizzly Wildlife Habitat Areas (WHAs)/Specified Areas or Coastal Ecosystem Based Management (EBM) areas within an LU.

Interpretation Key

- Indicator 1:
  - LUs with >60% of very high and high capability habitat protected are lower risk to grizzly bears.
  - LUs with 30 to 60% of very high and high capability habitat protected are moderate risk to grizzly bears.
  - LUs with <30% of very high and high capability habitat protected are higher risk to grizzly bears.
- Indicator 2:
  - If >0.05% of the LU comprises grizzly bear WHAs, WHAs are considered present and therefore lower risk.
  - If <0.05% of the LU comprises grizzly bear WHAs, WHAs are considered absent and therefore higher risk.

Benchmark

- Indicator 1:
  - Low Risk= >60% protected
  - Moderate Risk= 30-60% protected
  - High Risk= <30% protected
- Indicator 2:
  - Yes: LU contains >= 0.05% WHA/EBM areas (present)
  - No: WHA/EBM areas absent or < 0.05% (absent)

Management Context

Conservation management.

Regional Commentary:

LUs with 60% or more of high-capability grizzly bear habitat protected (e.g., in parks, wildlife management areas, old growth management areas, and WHAs for other species) are limited to the northern LUs of the Finlay-Ospika, Omineca and Parsnip GBPUs. These LUs are not flagged for management attention at this time.

In contrast, southern portions of the Finlay-Ospika, Omineca, Moberly, Nation, Parsnip, Nulki, and Robson GBPUs have large areas with minimal to no protection for grizzly bear habitat and are therefore flagged for management attention.

Grizzly bear habitat can be protected through the establishment of WHAs in cases where the habitat protection does not unduly impact provincial timber supply and does not have a material adverse impact on Delivered Wood Costs (DWCs). Assessing if there is a material adverse impact on DWC is required in the FRPA Government Actions Regulation policy and procedures.

There are no grizzly bear WHAs in the Omineca Region (Figure 4.12); however, one is proposed (T'lo Ba in the Nation GBPU). WHAs and other protected areas should be established in areas that have both quality food and habitat resources to support grizzly bear populations.

[38] As referenced in the Grizzly Bear Protocol - Appendix 2 Data Dictionary (BC MFLNRORD & BC MOECCS, 2020).

Further analysis and investigation related to this indicator could include:

- Consideration of how to improve the quality habitat layer from capability to suitability and/or update once important foods are determined through area-specific diet analysis (see Section 4.9 for details).

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has ***moderate*** *relevance and* ***low*** *precision*. Rationales for these rankings are described in Table 4.11 below.

Table 4.11 *Habitat Protection (Supplemental) Indicator Relevance and Precision Ranking*

Indicator Quality	Ranking	Rationale
Relevance	Moderate	Maintaining high quality forage in protected habitats is important in maintaining long-term viability of grizzly bear populations. However, BEI capability rather than a suitability indicator reduces the importance of this indicator. Considerable amounts of grizzly bear forage are usually available outside protected areas as well but in a less-than-predictable state (e.g., not protected from timber harvest)
Precision	Low	The use of BEI capability reflects the forage potential but does not illustrate current state of forage availability in protected areas thus creating a good deal of uncertainty on actual forage availability.

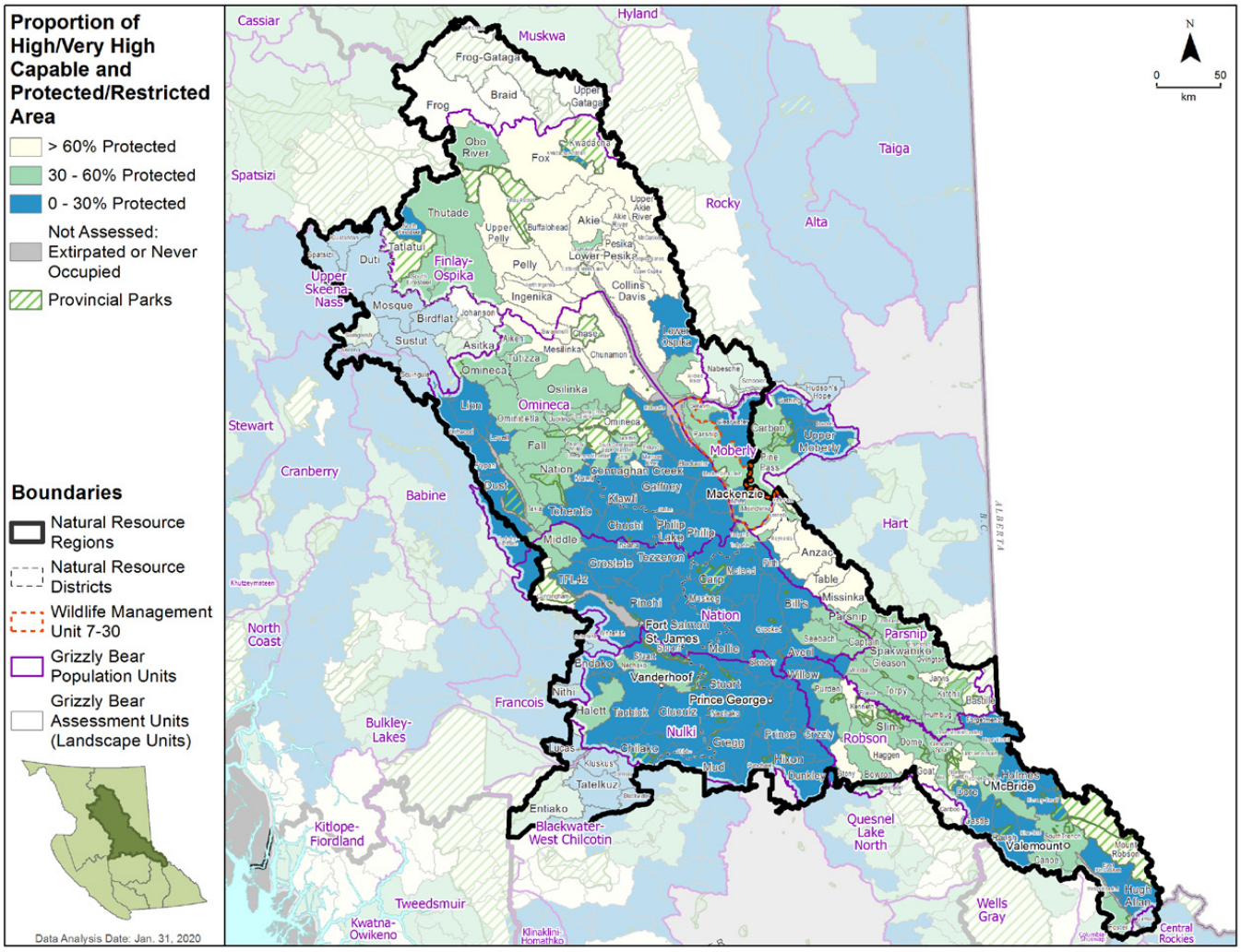

Figure 4.11 *Quality Habitat Protected – Omineca Region*

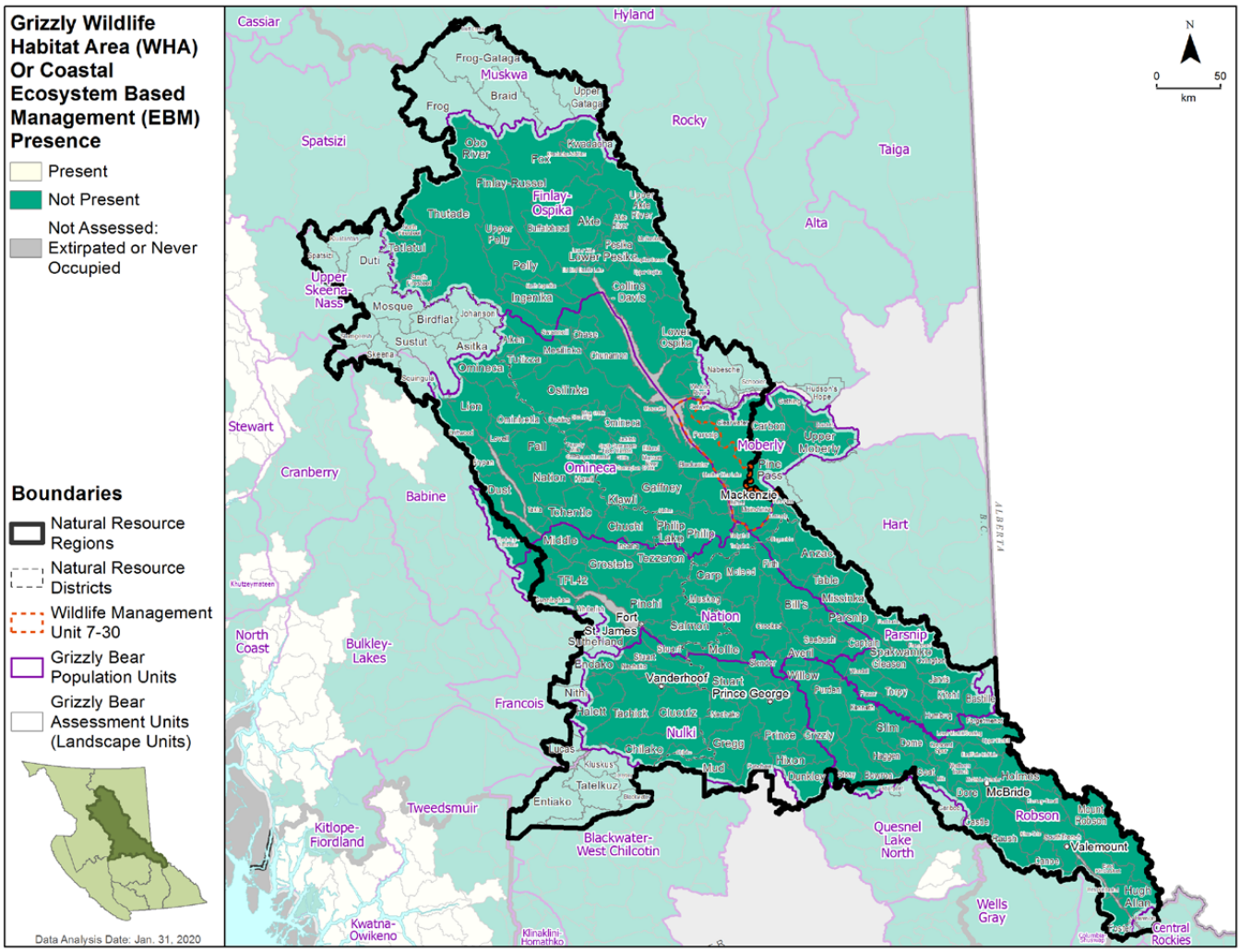

Figure 4.12 *WHA and EBM Areas – Omineca Region*

5 CONCLUSION & NEXT STEPS

Grizzly bears are susceptible to cumulative impacts on their populations and habitat from extensive land use activities and disturbances. Within the Omineca Region, various historic, present, and future anthropogenic activities and natural disturbances have the potential to impact grizzly bears.

This section discusses the results of this assessment and provides next steps to improve grizzly bear populations and habitat within the region, as well as suggestions from regional experts for further investigation or additional research that could be undertaken related to the assessment indicators and improvements to future assessments.

5.1 MAIN OBSERVATIONS

Grizzly Bear Conservation Concern Rank and Abundance

Grizzly bear **conservation concern rank** varies throughout the Omineca Region. The majority of the Finlay-Ospika, Omineca and Parsnip GBPUs are ranked as Very Low (M5) conservation concern, indicating that grizzly bear populations are at a low risk. In contrast, the Nation and Robson GBPUs are ranked as Moderate (M3) conservation concern and the Moberly and Nulki GBPUs are ranked as High (M2) conservation concern. Because GBPUs and LUs span into the Skeena, Cariboo and Northeast Natural Resource Regions, further investigation and cross-regional management should be conducted to ensure that grizzly bear populations and habitat are sustained.

Estimated population densities are highest in the Parsnip, Robson, Finlay-Ospika and Omineca GBPUs, where the average grizzly **bear density** is >10 bears/1000 km^2. These GBPUs are considered to be lower risk for grizzly bears from an abundance perspective. However, portions of the Omineca, Moberly, Nation and Nulki GBPUs have been flagged as having low bear density (<10 bears per 1000 km^2). Flags within these LUs are likely due to human presence in local communities (Prince George and Vanderhoof) and human activities that may have a negative effect on grizzly bear populations and habitat.

Human Presence and Activities

Human activities and presence have the potential to pose a threat to grizzly bears in the Omineca Region. The extent of human presence, access, and expansion is apparent in certain areas of the region, notably around communities such as Prince George, Vanderhoof (Nulki GBPU) and Mackenzie (Moberly GBPU) where the **front country** indicator is flagged. **Mortality** is flagged within and around these communities and respective LUs, as well as along highways and roads that connect these cities including Highways 97, 16, 39 and 27 where **road density** is highest and flagged for management attention.

These results are inversely related to **core security** in the Omineca Region where the areas of highest human activity have the lowest prevalence of core security areas, such that grizzly bears in those areas have a harder time finding areas with minimal human use.

The **hunter day density** indicator also flags areas throughout the Nation and Nulki GBPUs where humans are present and activities and access in the region occurs.

Habitat Quality & Protection

In general, the Omineca Region supports moderate to high quality habitat for grizzly bears. Only a few LUs have been flagged for **mid-seral dense conifer** (>30%) and are limited to the Finlay-Ospika, Nation and Nulki GBPUs. This is likely a result of lower resource use and natural disturbance regimes or challenges with the data used to develop the indicator.

Various grizzly bear habitat protection measures are in place throughout the Omineca Region in the form of provincial parks and protected areas, wildlife management areas, land and resource management plans, and through provincial Acts, policies and strategies (see Section 2.2). However, there are no WHAs for grizzly bears that are currently established in the Omineca Region, although one is proposed.

The majority of **habitat protection** (>60% protected) is located in the Finlay-Ospika GBPU and in certain portions of the Omineca and Parsnip GBPUs. These GBPUs and LUs overlap into the Skeena, Cariboo, and Northeast Natural Resource Regions, and therefore coordinated management efforts are required to preserve grizzly bear habitat in these areas.

Quality Food Sources

Overall, the Omineca Region has relatively good **quality food** sources (salmon and vegetation) for grizzly bears. There are multiple salmon-bearing rivers throughout the region; however, salmon productivity is variable, and may be further impacted by climate change into the future.

While food sources and habitat for grizzly bear currently exist in the Omineca Region, it is possible that climate change may impact these life requisites in the future. Shifts in vegetation, changing precipitation patterns (e.g., drought, and flood events), forest fires, and increased stream temperatures may result in bear ranges to expand or shift in search for food and may increase human-bear conflicts. While the effects of climate change on grizzly bears may be positive or negative, the full extent of these impacts are not fully known.

5.2 FURTHER ANALYSIS & INVESTIGATION

As this initial assessment is at a broad scale, further research, analysis, and refinement at the regional level could improve the quality and applicability of some indicators. However, information provided in this current condition report should be used by land managers in the interim to assess the potential cumulative impacts of further developments on the landbase.

Further investigation into the indicators, improvements to future assessments, and additional research that could be undertaken at the regional level includes:

- **Number of Bears**: Conduct field-based trend or population inventory data to develop appropriate mitigation measures and/or monitor the efficacy of mitigation measures implemented from incremental increases in human activity in at-risk areas.

- **Mortality Rate**: Identify where hunt opportunities were reduced in the past to remain within sustainable levels. This will provide an extra layer of information for decision-makers to note where mortality levels were close to being exceeded and may inform future land use proposals. This work is a low priority unless the grizzly bear hunt reopens.
- **Road Density**: Further refine the analysis to include weighting roads by different levels of accessibility across the Omineca Region.
- **Core Security**: Assess the amount and quality of forage in core security areas to improve the functionality for grizzly bears. Assess where non-core security areas overlap key forage availability to focus restoration/road reclamation efforts to increase the availability of core security habitats with forage. Future developments and human activity should be avoided in these areas if restoration activities occur.
- **Front Country**: Refine the analysis to incorporate information on road accessibility in the Omineca Region based on regional knowledge to discrepancies in the indicator results.
- **Poor Forage Potential (BEC Mid-Seral Conifer)**: Investigate temporal variation in early-seral forests to determine which LUs will reach the mid-seral threshold in the next 10 years, and highlight results for decision-makers. Assess the spatial arrangement of the flagged mid-seral polygons to provide decision-makers a fine- scale for consideration in their decisions. Use regional expertise to determine why indicator status for some LUs varies from regional knowledge (i.e, if a LU is not flagging and there is a regional expectation that it should flag or be very close to flagging, further investigation should be undertaken).
- **Quality Food**: Run the analysis using a suitability indicator to demonstrate the availability of quality foods in the current forest state (BEI is a capability assessment which predicts how good an area can be for bear foods if it was in its most appropriate state, not current forest state). Refine the definition of quality foods through diet analysis (isotope) of existing grizzly bear hair samples and relate the indicator thresholds to the prevalence of those foods in bear diets. This step may also provide some insight into a minimum amount of salmon that must be available to be considered a key food source (e.g., is the 10,000kg cut-off appropriate?). Add information to the salmon data layer to include an adjustment for salmon availability that reflects stream features that influence bears' ability to utilize spawning salmon (i.e., high amounts of spawning salmon might be present in a stream but if the stream is too deep to be fishable by bears, those salmon are not truly available to bears). Set a plan to re-run the analysis every five years to incorporate the effect of continued declines in salmon availability.
- **Habitat Protection**: Consider how to improve the quality habitat layer from capability to suitability and/or update once important foods are determined through area-specific diet analysis.

5.3 RECOMMENDED NEXT STEPS

Based on the results outlined in this report, there are many opportunities that exist to enhance grizzly bear populations and habitat in the Omineca Region.

Habitat Measures

Apart from addressing the indicator improvements to future assessments described above (Section 5.2), resource specialists and decision-makers should consider various habitat measures to support grizzly bear populations. Some habitat measures could include:

- Establishing grizzly bear WHAs in locations where grizzly bear habitat capability is high but populations are pressured by the combined effects of high road density, high hunter day density, and low core security areas would offer additional protection to grizzly bears now and in the future;
- Deactivating and/or restricting access on roads and corridors in high priority grizzly bear habitat, particularly where forage capability is high but core security areas do not exist, would also support grizzly bears and mitigate some effects from road development and use in the region; and,
- Adjusting forest planning and other practices in priority grizzly bear habitat to conserve or enhance the long-term availability of seasonal foraging habitats (e.g., berry production).

Supporting Future Current Condition Assessments

Continuing to monitor the current condition of grizzly bears in the Omineca Region is also recommended. As human activities continue and may potentially expand in the region, it is imperative that cumulative effects are monitored over time to determine if and how they are impacting grizzly bear populations and habitat.

Re-running this analysis every three to five years will likely be able to measure the spatial and temporal impacts from human activities in the region, from which mitigation measures can be applied and monitored for effectiveness in areas that are a high risk for grizzly bears. This timeframe for re-assessment should also consider the projections of human population, development and activities within the region and should be adjusted accordingly if activities are predicted to increase substantially in the near future, or are expected to be gradual over a longer term.

Considering the Effects of Climate Change

Climate change is a natural driver that has the potential to positively and negatively affect grizzly bears in the Omineca Region. Regional experts support monitoring the impacts of climate change throughout the region, particularly impacts on critical food sources. For example, monitoring precipitation, stream temperatures, and other metrics could be used to project future availability of salmon for grizzly bears in the Omineca Region.

Government Decisions and Plans

Finally, recent government decisions to develop a provincial grizzly bear management plan, to close the licensed grizzly bear hunt, and to modernize land use plans will be instrumental in providing additional management actions and considerations for land use decision-makers.

6 REFERENCES

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7 APPENDICES

APPENDIX 1 – GRIZZLY BEAR OBJECTIVES AND LEGAL PROTECTION

In B.C. and the Omineca Region, management and conservation of grizzly bears is governed by a number of provincial and regional strategies, legislation, land use plans, and management plans. A detailed description of the plans, strategies and legislation that are important for grizzly bears are described below.

Provincial Strategies and Management Plans

The Provincial Grizzly Bear Conservation Strategy (1995) establishes government's overarching objective for grizzly bears – to "maintain in perpetuity the diversity and abundance of grizzly bears and the ecosystems on which they depend throughout B.C. for future generations." A provincial grizzly bear management plan is currently under development.

In October 2017, the B.C. Auditor General released An Independent Audit of Grizzly Bear Management, which highlights the need for Government action to identify and secure key grizzly bear habitats, and to mitigate the impacts of human activities that degrade this habitat. The Government of B.C. committed to implementing the Auditor General's recommendations by creating a provincial grizzly bear management plan that will set clear policy objectives for managing and conserving grizzly bears across the province. In turn, this plan will inform the Omineca Region's actions to sustain grizzly bear populations and habitat. The December 2017 decision to ban licensed grizzly bear hunting across the province may further assist the Omineca Region in sustaining grizzly bear populations.

Licensed Grizzly Bear Hunt Closure

In December 2017, the B.C. Government announced a provincial ban on licensed grizzly bear hunting (other than hunting by First Nations for food, social and ceremonial purposes). Historically, hunting of grizzly bears was strictly regulated under the provincial *Wildlife Act*.

Since 2001, grizzly bear hunting was not permitted in threatened GBPUs or in GBPUs with low bear population densities (i.e., the number of bears per1000 km^2).[39] Where hunting was permitted, it was managed through limited entry hunts and quotas issued to guide outfitters.

Legislation

Forest and Range Practices Act (FRPA)

Under FRPA, grizzly bears are "identified wildlife" (a species that is vulnerable to the effects of forest and range practices). This means Government may establish legally enforceable WHAs and wildlife measures for grizzly bears in areas of high conservation priority. Grizzly Bear Accounts and Measures provide provincial policy guidance to inform forest and range planning and practices within grizzly bear habitat.

[39] As per British Columbia Grizzly Bear Population Estimate for 2018 (BC MFLNRORD, 2020)

Wildlife Act

In December 2017, the B.C. Government closed the licensed grizzly bear hunt. Up until this time, hunting of grizzly bears was highly regulated under the provincial *Wildlife Act*. Where hunting was allowed, it was managed through limited entry hunts (LEHs) and quotas.

In addition to enabling the regulation of hunting, the *Wildlife Act* (section 109) also enables government to regulate public access to the backcountry (e.g., road closures, motor vehicle restrictions) for the purpose of protecting or managing wildlife.[40]

Environmental Assessment Act

Major industrial projects – such as mines, pipelines, and hydropower generation projects – can threaten adjacent grizzly bears populations. As such, the most important legal tool for protecting grizzly bear populations and habitat in the Omineca Region is the environmental review and certification of major projects under the *Environmental Assessment Act*.

If a major project is deemed to impact grizzly bears, approval of the project may be subject to legally-binding conditions. These conditions specify that there must be a plan of actions to mitigate the impacts of the project to grizzly bear populations and habitat.

Other Legislation

***The Land Act* (section 66), FRPA (sections 22.2 and 58)**, and the ***Motor Vehicle Act* (All Terrain) (section 7)** also enable the provincial government to restrict land uses, recreation uses, road access, or use of all-terrain vehicles in the backcountry, all of which may assist in managing human access to bear habitat.

Land Use Plans

Land use plans in the Omineca Region establish resource management objectives and strategies for maintaining grizzly bear habitat and protecting bear populations on Crown lands.

The objectives and strategies for grizzly bears in these plans are not legally-binding but are intended to guide the operational planning and practices of tenured resource users on Crown lands. They generally call for:

- Identifying, mapping and protecting critical grizzly bear habitat in wildlife habitat areas;
- Incorporating priority grizzly bear habitats into connectivity and migration corridors;
- Maintaining forest attributes suitable for high capability grizzly bear habitat;
- Minimizing new roads and managing existing access through deactivation or access restrictions in critical grizzly bear habitat;
- Minimizing negative human-bear interactions through public education (e.g., how to avoid attracting bears to human areas, and how to behave during a bear encounter); and,
- Maintaining economic opportunities associated with hunting and commercial bear viewing.

A full list of the land use plans in the Omineca Region can be found here:
https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/omineca

[40] In addition to the *Wildlife Act*, the *Land Act* (section 66), the *Forest and Range Practices Act* (sections 22.2 and 58), the *Motor Vehicle (All Terrain) Act* (section 7) enables Government to restrict land uses, recreation uses, road access, or use of all-terrain vehicles in the backcountry, all of which may assist in managing human access to bear habitat.

Additional Resources

In addition to the references noted in previous sections, the following strategies, management guidelines, and best available information are worth considering when making decisions regarding future management and conservation of grizzly bear populations and habitat in the Omineca region.

- B.C. Government, 1995, Conservation of Grizzly Bears in British Columbia
- B.C. Government, 2004, Accounts and Measures for Managing Identified Wildlife (Grizzly Bear)

B.C. Government plans:

- B.C. Government, 2001, Be a Bear Smart Community (and other Bear Smart Resources and Publications).
- B.C. Government, 2006, Wildlife Guidelines for Backcountry Tourism/Commercial Recreation in British Columbia.
- Yukon Government, 2008, Guidelines for Industrial Activity in Bear Country: For the mineral exploration, placer mining, and oil and gas industries.
- B.C. Government, 2014, A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia (Interim Guidance).
- Boyce, Derocher, Garshelis, 2016, Scientific Review of Grizzly Bear Harvest Management System in British Columbia.
- B.C. Government, 2016, Climate Change Vulnerability of B.C.'s Fish and Wildlife: First Approximation.

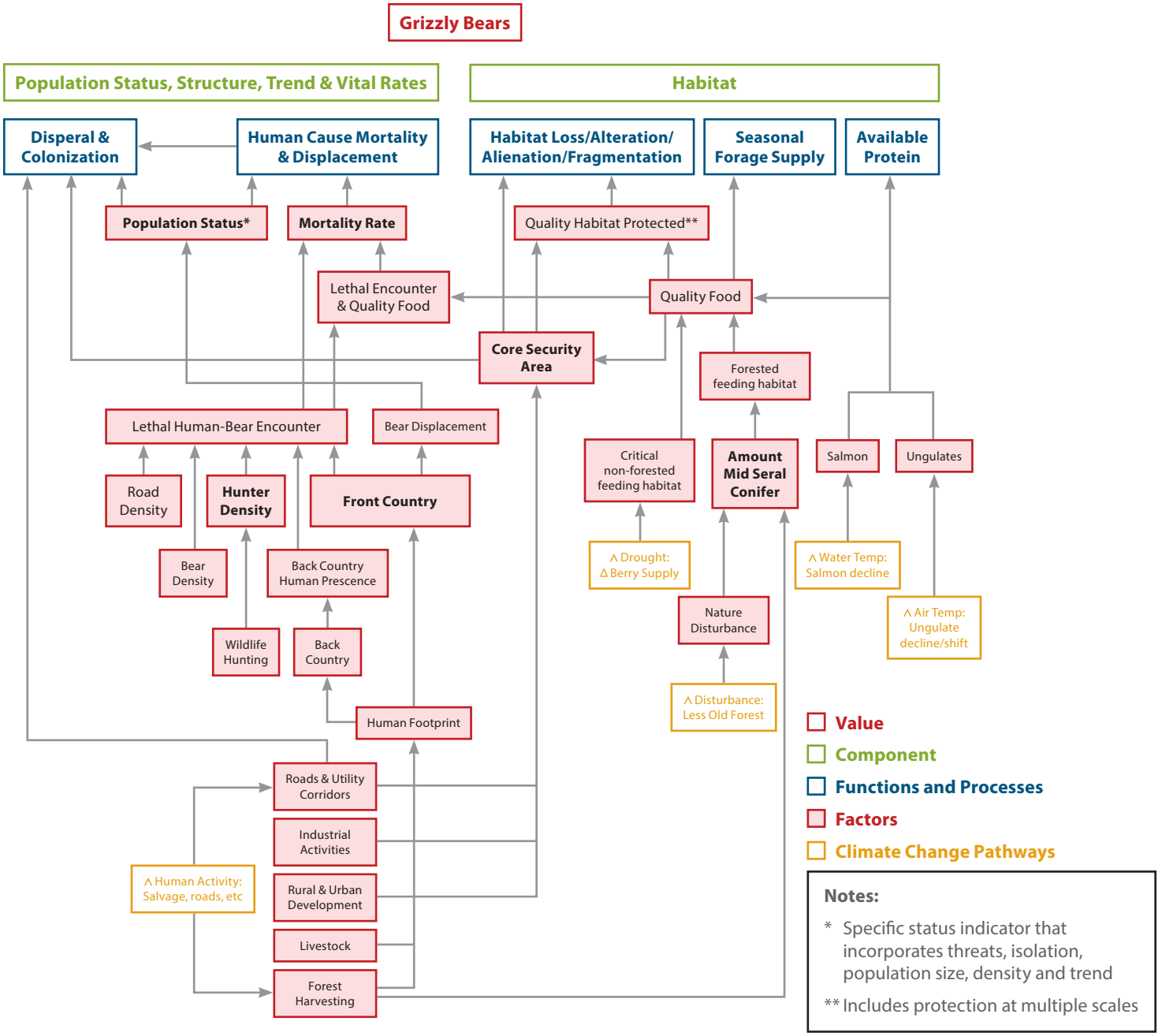
The following reports provide additional information or insights into the current condition of grizzly bears:

- B.C. Government, 2012, Grizzly bear population status in B.C.
- Stenhouse et al., 2013, Grizzly bears and pipelines: response to unique linear features. This report summarizes research on the use of pipeline rights-of-way by grizzly bears in Alberta.
- Boulanger and Stenhouse, 2014, The impact of roads on the demography of grizzly bears in Alberta. This report summarizes research on how road density affects grizzly bear population demographics and includes threshold road densities that may be used to manage population stability and recovery.
- B.C. Auditor General, 2017, An Independent Audit of Grizzly Bear Management.

APPENDIX 2 – CONCEPTUAL MODEL FOR ASSESSING GRIZZLY BEARS

This diagram illustrates how the indicators (a sub-set of the factors shown in the diagram)[41] influence the functions and processes that support grizzly bear populations and habitat in B.C.

Also shown are the factors considered to assess the risks from threats to grizzly bears and the pathways of effect resulting from climate change. However, those effects have not yet been spatially assessed but will be considered more explicitly in future versions of the protocol.



[41] The **bolded** factors (population status, mortality rate, hunter density, front country, core security area, and amount mid seral conifer) are *core indicators*, meaning they are the *primary* indicators used to assess potential risks to grizzly bears. *Supplementary indicators* were also assessed to provide important context information to support decision-making; the supplementary indicators are bear density, road density, quality food, lethal encounter potential and quality food, and quality habitat protected.

APPENDIX 3 – INDICATOR TABLES

Indicator	Key to Interpreting Risk Rating
Flag = assessment results indicate a higher risk to grizzly bears and are flagged for management attention	
Population Rank	Flag = High risk LUs (M1, M2, and M3)
Bear Density	Flag = bear densities in LU are less than 10 bears per 1000 km^2
Female Mortality Rate	Flag = annual mortality rate in LU exceeds regionally specified mortality limits
Road Density	Flag = road densities in LU are greater than 0.61 km/km^2
Core Security Area	Flag = less than 60% of LU is in core security areas
Front Country	Flag = greater than 20% of LU is in front country
Hunter Day Density	Flag = average annual hunter days in LU exceed 1.508812/km^2
Poor Forage Potential (BEC Mid-Seral Dense Conifer)	Flag = greater than 30% of LU is in mid-seral conifer forest
Quality Food	Flag = quality food is not present in LU (less than 50% of LU is in high/very high capability BEI and/or the LU's salmon biomass is less than 10,000 kg)
Quality Habitat Protected	Flag = less than 30% of LU's very high or high capability habitat is protected

GBPU/ Landscape Unit	Population Rank	Bear Density	Female Mortality Rate	Road Density	Core Security Area	Front Country	Hunter Day Density	Poor Forage Potential (BEC Mid-Seral)	Quality Food	Quality Habitat Protected- WHA/EBM	Quality Habitat Protected- Protected Areas
Finlay-Ospika											
Akie											
Akie River											
Buffalohead					Flag						
Collins - Davis											
Ed Bird Estells Lake											
Finlay-Russel											
Fox											
Ingenika											
Kwadacha	Flag		Flag								
Kwadacha Addition											Flag
Lower Akie											
Lower Ospika											Flag
Lower Pesika											
McCusker								Flag			
Nabesche[42]	Flag		Flag						Flag		
North Firesteel											Flag
North Ingenika											
Obo River											

[42] Nabesche has < 50% overlap with Finlay-Ospika GBPU; however, as a significant portion of the LU is within this GBPU, results are presented to inform decision-making. This LU is not counted in Table 2.1.

GBPU/ Landscape Unit	Population Rank	Bear Density	Female Mortality Rate	Road Density	Core Security Area	Front Country	Hunter Day Density	Poor Forage Potential (BEC Mid-Seral)	Quality Food	Quality Habitat Protected- WHA/EBM	Quality Habitat Protected- Protected Areas
Ospika Cones											
Pelly											
Pesika											
South Firesteel											
Swannell											
Tatlatui											
Thutade											
Upper Akie River											
Upper Ospika											
Upper Pelly											
Wicked River	Flag		Flag						Flag		
Moberly											
Carbon	Flag			Flag	Flag	Flag			Flag		
Clearwater	Flag					Flag			Flag		Flag
Gething	Flag			Flag	Flag	Flag					Flag
Heather Dina Lake	Flag	Flag	Flag		Flag	Flag					
Misinchinka	Flag		Flag	Flag	Flag	Flag					
Morfee	Flag	Flag	Flag		Flag	Flag					Flag
Parsnip	Flag	Flag	Flag			Flag			Flag		
Pine Pass	Flag			Flag		Flag			Flag		
Selwyn	Flag		Flag						Flag		
Upper Moberly	Flag			Flag	Flag	Flag			Flag		Flag
Nation											
Averil	Flag		Flag	Flag	Flag	Flag	Flag				Flag
Bill's	Flag			Flag	Flag	Flag	Flag				Flag
Captain	Flag			Flag	Flag				Flag		
Carp	Flag			Flag	Flag	Flag	Flag				Flag
Crooked	Flag			Flag	Flag	Flag	Flag				Flag
Cunningham	Flag	Flag	Flag					Flag	Flag		
Firth	Flag			Flag	Flag	Flag	Flag				Flag
Fleming	Flag	Flag	Flag	Flag	Flag						Flag
Grostete	Flag	Flag	Flag	Flag	Flag	Flag			Flag		Flag
Inzana	Flag	Flag	Flag	Flag	Flag	Flag					Flag
Mcleod	Flag			Flag	Flag	Flag	Flag				Flag
Middle	Flag	Flag	Flag	Flag	Flag	Flag			Flag		
Mollie	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Muskeg	Flag			Flag	Flag	Flag	Flag				Flag

GBPU/ Landscape Unit	Population Rank	Bear Density	Female Mortality Rate	Road Density	Core Security Area	Front Country	Hunter Day Density	Poor Forage Potential (BEC Mid-Seral)	Quality Food	Quality Habitat Protected- WHA/EBM	Quality Habitat Protected-Protected Areas
Pinchi	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Salmon	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Slender	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Seebach	Flag			Flag	Flag	Flag	Flag				
Stuart (LU 1173)	Flag	Flag	Flag	Flag	Flag	Flag	Flag				Flag
Tezzeron	Flag	Flag	Flag	Flag	Flag	Flag					Flag
TFL42	Flag	Flag		Flag	Flag	Flag		Flag	Flag		Flag
Tudyah A	Flag			Flag	Flag	Flag	Flag				Flag
Tudyah B	Flag			Flag	Flag	Flag	Flag				Flag
Whitefish	Flag	Flag		Flag	Flag	Flag					Flag
Nulki											
Chilako (LU 1505)	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Chilako (LU 1506)	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Cluculz	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Dunkley	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Endako	Flag	Flag	Flag	Flag	Flag	Flag	Flag		Flag		Flag
Gregg	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Grizzly	Flag		Flag	Flag	Flag	Flag	Flag				Flag
Halett	Flag	Flag		Flag	Flag	Flag	Flag				
Hixon	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Mud	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Nithi[43]	Flag	Flag		Flag	Flag	Flag	Flag		Flag		Flag
Prince	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Punchaw	Flag	Flag		Flag	Flag	Flag	Flag				Flag
Stuart (LU 1174)	Flag	Flag	Flag	Flag	Flag	Flag	Flag		Flag		Flag
Stuart (LU 1175)	Flag	Flag	Flag	Flag	Flag	Flag	Flag				Flag
Tachick	Flag	Flag	Flag	Flag	Flag	Flag	Flag				Flag
Omineca											
Aiken											
Blackwater		Flag	Flag	Flag	Flag	Flag					Flag
Chase											
Chuchi		Flag		Flag	Flag	Flag					Flag
Chunamon				Flag	Flag						
Connaghan Creek		Flag									
Discovery					Flag				Flag		

[43] Nithi has < 50% overlap with Nulki GBPU; however, as a significant portion of the LU is within this GBPU, results are presented to inform decision-making. This LU is not counted in Table 2.1.

GBPU/ Landscape Unit	Population Rank	Bear Density	Female Mortality Rate	Road Density	Core Security Area	Front Country	Hunter Day Density	Poor Forage Potential (BEC Mid-Seral)	Quality Food	Quality Habitat Protected- WHA/EBM	Quality Habitat Protected- Protected Areas
Driftwood		Flag	Flag			Flag			Flag		Flag
Duckling				Flag	Flag						
Dust		Flag	Flag		Flag						Flag
Eklund		Flag	Flag	Flag	Flag	Flag					
Fall						Flag					
Frypan		Flag	Flag			Flag			Flag		Flag
Gaffney		Flag	Flag	Flag	Flag	Flag					Flag
Germansen Mountain									Flag		Flag
Gillis									Flag		
Jackfish				Flag	Flag						
Klawli (LU 1629)		Flag			Flag				Flag		Flag
Klawli (LU 1630)		Flag							Flag		Flag
Lion		Flag	Flag		Flag	Flag			Flag		Flag
Lovell		Flag	Flag	Flag	Flag	Flag					Flag
Manson River		Flag		Flag	Flag	Flag					Flag
Mesilinka											
Muscovite		Flag	Flag								Flag
Nation (LU 1692)		Flag				Flag					
Nation (LU 1693)		Flag	Flag	Flag	Flag	Flag					Flag
Nina Creek											
Omineca (LU 1704)											
Omineca (LU 2213)			Flag								
Ominicetla											
Osilinka				Flag	Flag						
Philip	Flag	Flag	Flag	Flag	Flag	Flag					Flag
Philip Lake		Flag		Flag	Flag	Flag					Flag
South Germansen - Upper Manson				Flag	Flag						Flag
Takla		Flag	Flag			Flag			Flag		
Tchentlo		Flag		Flag	Flag	Flag					Flag
Tochcha - Natowite		Flag	Flag	Flag	Flag						Flag
Tutizza											
Twenty Mile									Flag		
Parsnip											
Anzac									Flag		
Bastille	Flag		Flag						Flag		
Fontinako									Flag		

GBPU/ Landscape Unit	Population Rank	Bear Density	Female Mortality Rate	Road Density	Core Security Area	Front Country	Hunter Day Density	Poor Forage Potential (BEC Mid-Seral)	Quality Food	Quality Habitat Protected- WHA/EBM	Quality Habitat Protected- Protected Areas
Framstead									Flag		
Fraser			Flag	Flag	Flag	Flag			Flag		
Gleason			Flag	Flag	Flag				Flag		
Humbug			Flag			Flag			Flag		
Jarvis									Flag		
Kennedy						Flag			Flag		
Kitchi									Flag		
Missinka									Flag		
Ovington									Flag		
Parsnip	Flag								Flag		
Pine Pass						Flag			Flag		
Reynolds						Flag			Flag		
Spakwaniko									Flag		
Table									Flag		
Torpy			Flag			Flag			Flag		
Woodall			Flag	Flag	Flag	Flag			Flag		
Robson											
Bowron	Flag		Flag			Flag			Flag		
Canoe	Flag		Flag			Flag			Flag		
Castle	Flag		Flag			Flag			Flag		Flag
Crescent Spur	Flag		Flag	Flag	Flag	Flag			Flag		
Dome	Flag		Flag		Flag	Flag			Flag		
Dore	Flag		Flag			Flag			Flag		Flag
East Kinbasket	Flag					Flag			Flag		Flag
EastTwin-McKale	Flag					Flag			Flag		
Forgetmenot	Flag					Flag			Flag		Flag
Foster	Flag					Flag			Flag		
Goat	Flag		Flag			Flag			Flag		
Haggen	Flag			Flag	Flag	Flag			Flag		
Holmes	Flag					Flag			Flag		Flag
Horsey-Small	Flag					Flag			Flag		Flag
Hugh Allan	Flag								Flag		Flag
Indianpoint	Flag			Flag	Flag	Flag					
Kenneth	Flag		Flag	Flag	Flag	Flag	Flag		Flag		
Kiwa-Tete	Flag		Flag			Flag			Flag		Flag
Lower Morkill/ Cushing	Flag		Flag			Flag			Flag		

GBPU/ Landscape Unit	Population Rank	Bear Density	Female Mortality Rate	Road Density	Core Security Area	Front Country	Hunter Day Density	Poor Forage Potential (BEC Mid-Seral)	Quality Food	Quality Habitat Protected- WHA/EBM	Quality Habitat Protected- Protected Areas
McBride-Dunster	Flag		Flag	Flag	Flag	Flag			Flag		
Milk	Flag		Flag			Flag			Flag		
Mount Robson	Flag					Flag			Flag		
Northern Trench	Flag		Flag	Flag	Flag	Flag			Flag		
Purden	Flag		Flag	Flag	Flag	Flag	Flag		Flag		
Raush	Flag		Flag			Flag					Flag
Slim	Flag		Flag	Flag	Flag	Flag			Flag		
SouthTrench	Flag		Flag	Flag	Flag	Flag			Flag		
Stony	Flag		Flag	Flag	Flag	Flag					
Upper Morkill	Flag								Flag		Flag
West Kinbasket	Flag			Flag	Flag	Flag					
Willow (LU 1813)	Flag		Flag	Flag	Flag	Flag	Flag				Flag

APPENDIX 4 – DATA

Please see the following link to access this dataset and metadata from British Columbia's Data Catalogue.

Please visit the Provincial Cumulative Effects Framework website for more information and to view reports for other regions across British Columbia.

BRITISH COLUMBIA
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
Ministry of Environment and Climate Change Strategy
CEF Cumulative Effects Framework