

# Current Condition Report for Grizzly Bear in the Kootenay-Boundary Region | 2019 Analysis

May 2023



Ministry of  
Water, Land and  
Resource Stewardship

**CEF** Cumulative  
Effects  
Framework

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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/BB796F2DAAAB4220942E4587DEE20C7B>

Cumulative Effects Framework Interim Policy for the Natural Resource Sector (October 2016). 32 pp. <https://www2.gov.bc.ca/assets/download/9342A9C980A7440C9E5A15EA591912D4>

### ***Disclaimer***

This current condition report was developed solely by the Province of British Columbia. This assessment is based on GIS information and has not been ground-truthed. There will be opportunities for First Nations and the Province of British Columbia to collaborate on future current condition reports, monitor the condition of Cumulative Effects (CE) values and validate the outcomes of these assessments.

**Title page photo credit:** Garth Mowat

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# EXECUTIVE SUMMARY

This current condition assessment for Grizzly Bear in the Kootenay-Boundary Region was developed under B.C.'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 their habitat relative to the provincial government's broad objectives for grizzly bears.

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

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

This report concludes that all GBPUs in the Kootenay-Boundary Region are of management concern and therefore require management attention when making decisions regarding grizzly bear populations and habitat.

At the LU level, the front country, core security and road density indicators were frequently flagged for management attention and drove overall rankings when rolled up at the GBPU level. Together, these indicators highlight high human activity across the region, which increases mortality risk for bears through human-bear encounters and habitat displacement (either through habitat loss or avoidance).

The highest risk areas for grizzly bears are in the southern and central portions of the Kootenay-Boundary Region, where human settlements and major road networks are located. While these areas have been historically impacted by human use, future management attention should be focused in remote areas with moderate or high road densities to avoid population and habitat fragmentation and to reduce the potential for human-bear conflicts. Human expansion into these remote/backcountry areas and creating a temporal disturbance along these road networks will have the potential to result in negative cumulative effects on grizzly bear populations and habitat.

Additionally, management attention should be focused on areas that support both grizzly bear habitat and quality food sources. The North Purcells and Central South Purcells GBPUs in the central portion of the Kootenay-Boundary Region have a moderate degree of habitat protection (through provincial parks, wildlife habitat areas, specified areas, etc.) and are also predicted to have sufficient quality food sources (mainly vegetation including berries) to support grizzly bears throughout the year.

Resource specialists and decision-makers should consider a series of mitigation measures when reviewing current and future proposed projects and activities in the Kootenay-Boundary Region to reduce the incremental loss of grizzly bear habitat and to support grizzly bear populations. Suggested mitigation measures include:

- Addressing road density, core security and front country, especially in LUs that are flagged. Regional experts recommend 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;
- Addressing expansion of humans into remote/backcountry areas;

- Establishing grizzly bear Government Actions Regulation (GAR) orders (or other protection measures) 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;
- 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);
- Adjusting best practices for development project and activities to mitigate project impacts to grizzly bear populations and habitat; and,
- Mitigating and reducing human-bear conflict by educating local communities on bear-smart initiatives (e.g., WildsafeBC, Bear Hazard Assessments).

Overall, decision-makers are encouraged to discuss proposed projects, activities, or plans with regional subject matter experts to better understand the potential cumulative effects on grizzly bears. These discussions will identify the appropriate mitigation measures to enhance grizzly bear populations and habitat in the region and identify where additional analysis may be warranted.

# LIST OF ACRONYMS

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

# GLOSSARY

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Benchmarks</b>                            | 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). |
| <b>Cumulative effects</b>                    | 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.                                                                                                                                                                          |
| <b>Grizzly Bear Population Units (GBPUs)</b> | 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.                                                                                    |
| <b>Landscape Units (LUs)</b>                 | 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.                                                                                            |
| <b>Precision</b>                             | 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.                                                                                                                               |
| <b>Relevance</b>                             | 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).                                                                                                                                                                                                               |
| <b>Utility</b>                               | Utility is defined as the ability to effectively manage the value in response to the indicator result. Strategic, tactical, and/or operational management actions may be taken.                                                                                                                                                                                                                       |
| <b>Wildlife Management Units (WMUs)</b>      | 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<sup>1</sup> 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.

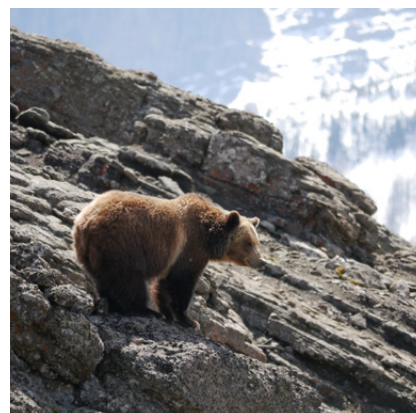
This report provides an overview of the current condition of grizzly bear within the Kootenay-Boundary Natural Resource Region (Kootenay-Boundary Region) as of 2019. This assessment uses a methodology that examines the status of grizzly bear populations, the capacity of grizzly bear habitat to provide 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 Kootenay-Boundary 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 Kootenay-Boundary 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 grizzly bear habitat in the Kootenay-Boundary Region.

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.



*Photo: Troy Malish*

<sup>1</sup> 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 (Province of BC, 2016).

## 2 GRIZZLY BEAR OVERVIEW

In B.C., grizzly bears have significant ecological, cultural and economic importance. Ecologically, they are an umbrella species that reflect the overall health of the ecosystems they inhabit. Culturally, many First Nations in B.C. include grizzly bears in their cultural and spiritual traditions, histories, and philosophies. Economically, ecotourism and bear viewing are important to the provincial economy (though opportunities are limited in the Kootenay-Boundary Region).

Grizzly bears are identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as a species of “special concern” in Canada, 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) (Government of Canada, 2011). Under B.C.’s Conservation Framework, 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 Kootenay-Boundary Region, including a description of their habitat needs, dietary preferences, and distribution. The potential threats to grizzly bear populations and habitat in the Kootenay-Boundary 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<sup>2</sup> 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.

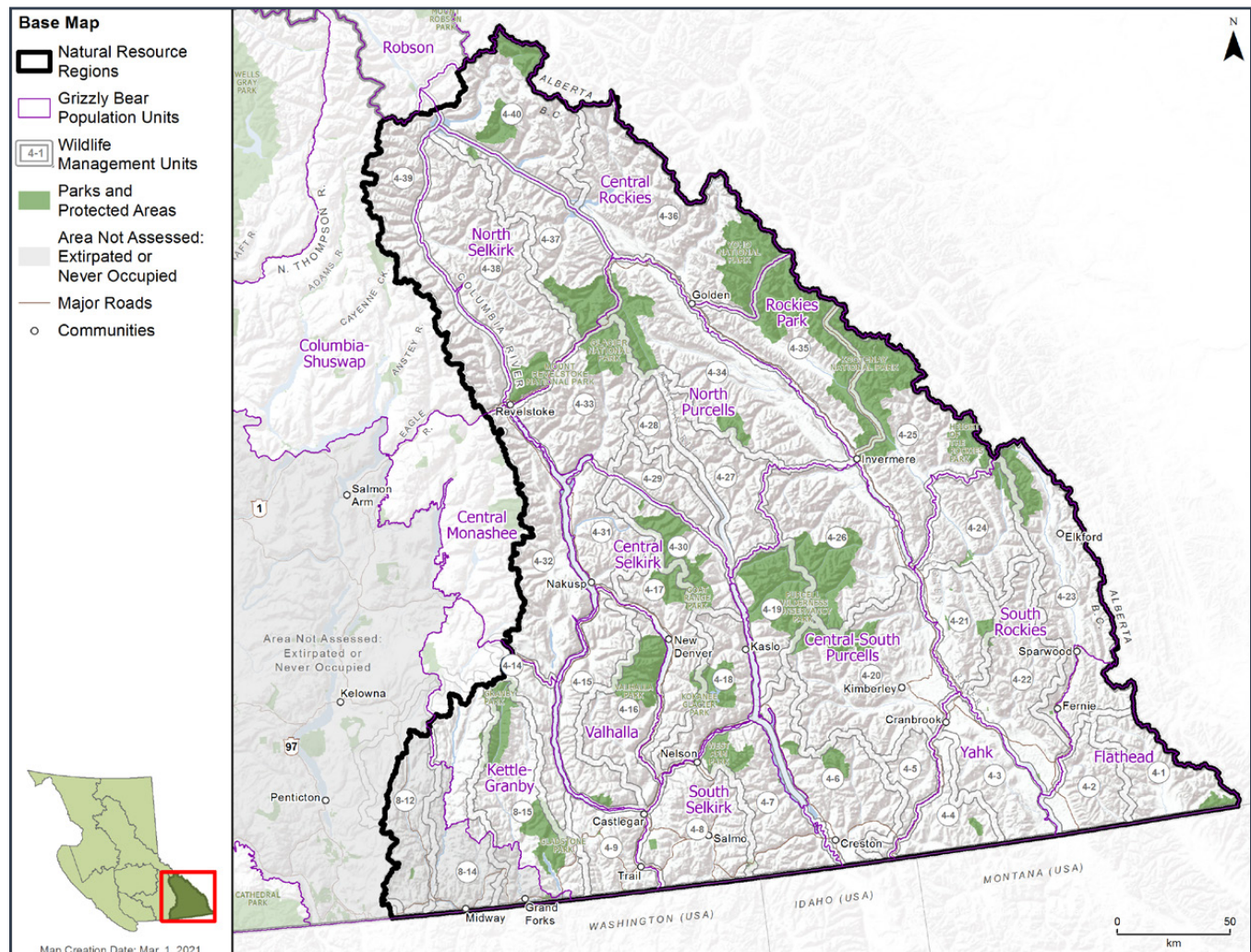
As a grizzly bear’s habitat use varies with the seasons, so does a grizzly bear’s diet. Grizzly bears are omnivores and mainly consume vegetation such as forbs, grasses, roots, and sedges from riparian areas and warm-aspect avalanche chutes in spring and early summer (EV CEMF, 2018). In the late summer and fall, buffaloberries (*Shepherdia canadensis*) and huckleberries (*Vaccinium membranaceum*) become important food sources as the bears attempt to build body fat for winter (EV CEMF, 2018).

Protein sources such as ungulates and spawning salmonids are also consumed by grizzly bears in the autumn and early spring. Carcasses of winter-killed individuals are scavenged in the spring, road kill is scavenged throughout the year, and gut piles from hunters are scavenged in the fall (EV CEMF, 2018).

<sup>2</sup> Krummholz are areas of stunted windblown trees growing near the tree line on mountains.

## 2.2 DISTRIBUTION & MANAGEMENT IN THE KOOTENAY-BOUNDARY REGION

Grizzly bears are found throughout the Kootenay-Boundary Region, apart from a small extirpated<sup>3</sup> portion in the south-western part of the region (Figure 2.1). This extirpated area is contiguous with an area of the province stretching from the United States border and to the Kootenay-Boundary Region in the north that has been impacted by habitat loss associated with human settlement.



**Figure 2.1** Grizzly bear population units and wildlife management units in the Kootenay-Boundary Region.

There are 14 grizzly bear population units<sup>4</sup> (GBPUs) wholly or partially located within the Kootenay-Boundary Region (Figure 2.1).

<sup>3</sup> 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).

<sup>4</sup> 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.

**This report provides information for the following GBPU's that largely fall within (>50% in area) and are directly managed by the Kootenay-Boundary Region: Central Rockies, North Selkirk, Central Selkirk, South Selkirk, Rockies Park, South Rockies, North Purcells, Central & South Purcells, Yahk, Flathead, Valhalla, and Kettle-Granby.**

As some GBPU's overlap regional and international boundaries, co-management is required to sustain grizzly bear populations and habitat. The Kettle-Granby is co-managed with the Thompson-Okanagan Natural Resource Region, and the South Selkirk and Yahk GBPU's are co-managed with the United States.

The Columbia-Shuswap and Central Monashee GBPU's are partially located (<50% area) within the Kootenay-Boundary Region and are co-managed with the Thompson-Okanagan Natural Resource Region. Since less than 50% of the area of these GBPU's is located in the Kootenay-Boundary Region, assessment results for these GBPU's are presented in the Current Condition Report for Grizzly Bear in the Thompson-Okanagan Region – 2021 (MFLNRORD, 2021).

There are also 39 Wildlife Management Units (WMUs) for which game management objectives and hunting regulations are set that overlap with the seven GBPU's managed by the Kootenay-Boundary 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.

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

**Table 2.1** GBPU's, WMUs, and LUs Managed by the Kootenay-Boundary Region<sup>5,6</sup>

| GBPU                   | Number of LUs <sup>5,6</sup> | Number of WMUs | WMUs in Region               |
|------------------------|------------------------------|----------------|------------------------------|
| Central Rockies        | 17                           | 2              | 4-36 & 4-40                  |
| North Selkirk          | 17                           | 2              | 4-37 & 4-38                  |
| Central Selkirk        | 10                           | 4              | 4-17, 4-18, 4-30, 4-31       |
| South Selkirk          | 10                           | 2              | 4-7 & 4-8                    |
| Rockies Park           | 18                           | 2              | 4-25 & 4-35                  |
| South Rockies          | 21                           | 4              | 4-21, 4-22, 4-23, 4-24       |
| North Purcells         | 24                           | 5              | 4-27, 4-28, 4-29, 4-33, 4-34 |
| Central-South Purcells | 29                           | 5              | 4-5, 4-6, 4-19, 4-20, 4-26   |
| Yahk                   | 7                            | 2              | 4-3 & 4-4                    |
| Flathead               | 8                            | 2              | 4-1 & 4-2                    |
| Valhalla               | 9                            | 2              | 4-15 & 4-16                  |
| Kettle-Granby          | 13                           | 2              | 4-9 & 8-15                   |

<sup>5</sup> LUs may not be completely located within the administrative boundaries of a GBPU. For this assessment, LUs are considered to be inside a GBPU if >50% of the area is located in the GBPU.

<sup>6</sup> See Appendix 3 for the full list of LUs.

## 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 Kootenay-Boundary Region include industrial activities, road development, human presence, access management and climate change.

### Industrial Activities

Forest harvesting and mining are the most predominant industrial activities within Kootenay-Boundary Region. The majority of mining projects are concentrated in the south eastern part of the region in the Elk Valley. Multiple open-pit coal mines are in operation in the Elk Valley (Fording River, Elkview, Greenhills and Line Creek Operations) and a variety of additional mines and mine expansions are proposed (Fording River Extension-Castle, Crown Mountain Coking Coal, and Michel Coal).

Hydroelectric activities also are present along the Columbia River, and a variety of recreation and tourism activities (ski resorts, ecotourism, etc.) are also present throughout the region.

These industrial activities vary in size and may operate on different temporal scales (e.g., year-round or seasonally) and may individually and/or collectively 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 humans to access otherwise inaccessible backcountry areas. Impacts of road development on grizzly bears are discussed below.



### 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.<sup>7</sup> Furthermore, most grizzly bear mortality from human encounters occurs within 500 metres of a road.

However, grizzly bears are often attracted to roads due to seeding, increased prey availability and ease of movement. 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.



<sup>7</sup> 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.

### 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.<sup>8</sup>



### Climate Change

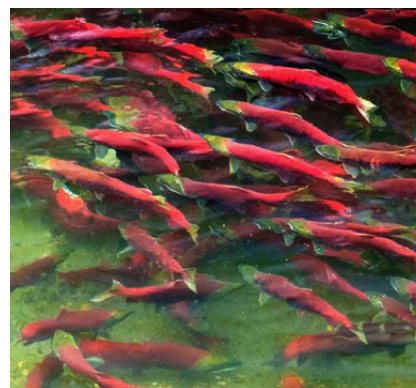
The effects of climate change on grizzly bears are uncertain because climate change may create both positive and negative environmental conditions for grizzly bears. See below for a description of the anticipated effects of climate change on grizzly bears in the Kootenay-Boundary Region.

#### *Potential Effects of Climate Change on Grizzly Bears in the Kootenay-Boundary Region*

The climate in the Kootenay-Boundary 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 3 to 7°C in summer and 2 to 5°C in fall, winter, and spring. More heat waves are expected. Precipitation is projected to increase in fall, winter, and spring, whereas summer precipitation is projected to decrease. Summer drought will have the greatest impact in the dry climate sub-region and on the driest sites within all sub-regions, where vegetation is already near thresholds. Warming is expected to reduce snowpack in most of the region, particularly at low elevations. 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 (BC MFLNRO, 2016). Projections for the Kootenay-Boundary Region are more complex; climate envelopes projected to occur in this region in the 2080s are currently found as far north as coastal Alaska and as far south and east as Colorado and Kansas. Ecosystems may undergo regime shifts, for example, conversion of forests to shrubs or grassland ecosystems. Alpine habitats are projected to contract significantly. The increased prevalence of natural disturbance will vary by climatic sub-region, elevation, and forest type. More frequent, severe, and extensive wildfires are predicted across low elevations, whereas changes in fire regime for higher elevations and in the Rocky Mountains are less clear.

Grizzly bears are highly adaptable omnivores with a diverse foraging strategy (MacHutchon, 2021); predicting the multiple trophic effects of climate change on bears is complicated (BC MFLNRORD, in prep.). This species' ability to move long distances across various habitat types to track seasonally available forage may buffer against some of the anticipated effects of climate change (Ciarniello, 2018). Nevertheless, climate change will influence availability



<sup>8</sup> 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.

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 have lower reproduction rates; those with very low ( $\leq 20\%$ ) 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. Where available, black huckleberry (*Vaccinium membranaceum*) is the primary species consumed by grizzly bears across the province; fruiting species of secondary importance in the Kootenay-Boundary Region may include soapberry/soopolallie/buffaloberry (*Shepherdia canadensis*), oval-leaved blueberry (*Vaccinium ovalifolium*), grouseberry (*Vaccinium scoparium*), and saskatoon (*Amelanchier alnifolia*) (MacHutchon, 2021). Black huckleberry distribution in the Kootenay-Boundary Region is projected to contract at lower elevations, while expanding northward and into higher elevations where soil conditions are suitable (Prev  y et al., 2020). Berry supply may be variable, decreasing in areas affected by drought, yet increasing in areas disturbed by fire (Prev  y et al., 2020). Warmer winter and spring temperatures are expected to advance the timing of flowering and fruit production, potentially affecting berry quality and quantity (Laskin et al., 2019; Prev  y et al., 2020). Earlier flowering may increase risk of frost damage and/or asynchronization with pollinators, resulting in berry crop failures (Prev  y et al., 2020). Earlier ripening may widen the gap between berry availability and hibernation, negatively affecting female body condition and reproduction (Laskin et al., 2019).



Climate change is projected to decrease the supply of whitebark pine (*Pinus albicaulis*) seeds, a high-quality food source preferentially consumed by grizzly bears where available (Ciarniello, 2018). Whitebark pine has already declined across its range in western North America due to the combined effects of white pine blister rust, mountain pine beetle, and fire suppression; climate change will further amplify the decline of this sub-alpine tree species (COSEWIC, 2010; Keane et al., 2017). Bioclimate envelope models for British Columbia project that 73% of the current habitat of whitebark pine will be lost by 2085 (Hamann and Wang, 2006). Although whitebark pine seeds are not likely a significant food source in the Kootenay-Boundary Region, incidental observations suggest that some individuals focus on consuming pine seeds in some locations and in some years (McLellan & Hovey, 1995; B.N. McLellan, pers. comm., May 11, 2021). Whitebark pine has suffered greater declines in the Kootenay-Boundary Region than in other regions, thus Kootenay-Boundary grizzly bears may have already been disproportionately affected by reduced seed availability (M. Murray, pers. comm., May 11, 2021). How the continued decline of whitebark pine will affect grizzly bears in the Kootenay-Boundary Region is unknown (G. Mowat, pers. comm., May 11, 2021).



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 because of a longer growing season, thereby extending the foraging period (Ciarniello, 2018). Summer moisture deficit, however, may constrain vegetation productivity in drier southern areas of the Kootenay-Boundary Region (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, wetlands already in decline due to draining and hydrologic changes may decline further (BC MFLNRO, 2016), and avalanche chutes may become less common due to reduced snowpack (Butler, 2012). Upslope migration of forage plant species, particularly berry-producing shrubs, may improve habitat quality at higher elevations, offsetting some of these losses (Roberts et al., 2014).

Climate change is expected to affect abundance and distribution of freshwater fish and terrestrial prey species. Kootenay-Boundary grizzly bears will consume kokanee (land-locked salmon) where available (G. Mowat, pers. comm., May 7, 2021; Sanders, 2016). Recent collapse of the Kootenay Lake kokanee population (BC MFLRNORD, 2021), along with projected hydrological regime changes, warmer stream and lake temperatures, and increased sedimentation (BC MFLNRO, 2016) may threaten this food source (BC MF, 1999). Ungulates are consumed by some Kootenay-Boundary grizzly bears, particularly those in the Kettle-Granby, Central Monashee, Central-South Purcells, South Rockies, and Flathead GBPU's (McLellan & Hovey, 1995; Mowat & Heard 2006). Climate change is projected to favour generalist species such as elk and deer (Price & Daust, 2016); how this will affect Kootenay-Boundary grizzly bears is unknown given that grizzly bears are opportunistic predators and not all individuals consume meat (Mowat & Heard 2006).

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). Individuals can adapt their foraging behaviour to co-exist with humans, however, human-caused mortality, either directly through human-bear conflicts or indirectly through habitat loss, will likely continue to threaten grizzly bear populations (Lamb et al., 2020). Warmer spring temperatures, reduced snowpack, and a longer growing season are expected to shorten the hibernation period, which may negatively affect cub body condition and survival, as well as increase the probability of human-bear conflicts (Pigeon et al., 2016). Land use will likely expand and/or shift with the changing climate, contributing to further habitat loss (Price & Daust, 2016).

Persistence of grizzly bears in human-dominated landscapes will continue to be a challenge (Lamb et al., 2020). Motorized access management, key to minimizing human-caused mortality, will be most effective when applied across smaller areas to optimize the protection of high-quality habitats to benefit female distribution, survival, reproduction, and density across a broad area (Proctor et al., 2019). Re-establishing and/or enhancing inter-population movement will also be critical to ensuring the persistence of grizzly bears, particularly for the highly/totally isolated populations along the Canada-US border in the Kootenay-Boundary Region (Proctor et al., 2012; Environmental Reporting BC, 2020).



## 2.4 GRIZZLY BEAR MANAGEMENT, OBJECTIVES AND GUIDANCE

In B.C. and in the Kootenay-Boundary Region, the management and conservation of grizzly bears is governed by a number of provincial and regional strategies, legislation, land use plans, and management plans. Legislation and any legal orders related to these documents are legally enforceable, and the non-legal direction is also important as it outlines important management and conservation objectives.

A brief description of strategies, plans, and legislation that apply provincially and in the Kootenay-Boundary Region are listed below. For more detailed information, please refer to Appendix 1.

### Provincial Broad Objectives & Plans

- **Provincial Grizzly Bear Conservation Strategy:** overall objective to “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.

### Regional Objectives & Plans

- **Land and Resource Management Plans<sup>9</sup>** for the Kootenay-Boundary Region call for:
  - Conserving productive and/or critical feeding and breeding habitats;
  - Using regional connectivity corridors to provide dispersal corridors between population units;
  - Using timber harvesting and silvicultural methods that sustain food production;
  - Setting road densities and objectives by managing access by designated units; and,
  - Manage core grizzly bear areas for high densities to encourage emigration.



<sup>9</sup> For more information on the Land and Resource Management Plans in the Kootenay-Boundary Region, visit <https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/kootenay-boundary>

## Legal Tools for Grizzly Bear Protection

Legally enforceable measures for the management and conservation of grizzly bears and their habitat may be available under existing legislation. A brief description of potential legal mechanisms is provided below. For more detailed information, please refer to Appendix 1.

- **Forest and Range Practices Act (FRPA) Government Actions Regulation (GAR):** under section 10 of FRPA GAR, the minister responsible for the *Wildlife Act* by order may establish an area as a wildlife habitat area (WHA) if satisfied that the area is necessary to meet the habitat requirements of a category of species at risk or regionally important wildlife. The minister may also establish WHA objectives for a WHA if they are satisfied that the WHA requires special management.<sup>10</sup> GAR also provides the minister with authority to make orders establishing wildlife habitat features requiring special management and general wildlife measures applicable to a specified area to protect or conserve regionally important wildlife and species at risk.
- **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.<sup>11</sup>
- **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 WHAs. These designations have a maximum term of thirty years, and terms over ten years must be reviewed every ten years. Additionally, under section 66, the uses of Crown land in a designated area may be prohibited by the Lieutenant Governor in Council.

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 (in development).

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 (in development) will enable further regional actions for managing factors that impact grizzly bears.

<sup>10</sup> WHAs may only be established in cases when the establishment is consistent with established objectives, and the order would not unduly impact provincial timber supply, and benefits to the public derived from the order would outweigh any:  
(i) material adverse impact on the delivered wood cost of a holder of an agreement under the Forest Act that would be affected by the order  
(ii) undue constraint on the ability of a holder of an agreement under the Forest Act or the Range Act that would be affected by the order to exercise the holder's rights under the agreement

<sup>11</sup> 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 report follows the methodology outlined in the Interim Assessment Protocol for Grizzly Bear in British Columbia, Version 1.2 (the Protocol) (BC MFLNRORD & BC MOECCS, 2020). The Protocol provides an initial 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, which are based on the current scientific understanding of grizzly bear ecology.

In this report, the current condition of grizzly bear populations within the Kootenay-Boundary 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.<sup>12</sup> 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**, **relevance** and **utility**)<sup>13</sup> 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.

<sup>12</sup> LUs more closely approximate the size of one to several adult female home ranges.

<sup>13</sup> See Glossary for definitions of precision, relevance, and utility as used in this assessment.

**Table 3.1** Overview of Grizzly Bear Assessment Indicators

| Indicator                                            | Description                                                                                                                                                                                                                           |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Population Indicators</b>                         |                                                                                                                                                                                                                                       |
| Population Rank*                                     | The conservation status of each GBPU in B.C.                                                                                                                                                                                          |
| Number of Bears <sup>+</sup>                         | The estimated number of bears per 1000 km <sup>2</sup> within each GBPU                                                                                                                                                               |
| Mortality Rate*                                      | The percent annual female mortality of the estimated total GBPU grizzly bear population                                                                                                                                               |
| Road Density <sup>+</sup>                            | The total length of roads (and pipeline corridors, transmission line rights-of-way, and rail lines) divided by total LU area (km/km <sup>2</sup> )                                                                                    |
| Core Security Area*                                  | Patches of secure grizzly bear habitat (with minimal likelihood of human use) greater than 10 km <sup>2</sup>                                                                                                                         |
| 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) |
| Hunter Day Density*                                  | The number of days per year that hunters occupy WMUs                                                                                                                                                                                  |
| <b>Habitat Indicators</b>                            |                                                                                                                                                                                                                                       |
| Poor Forage Potential (BEC 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                                                                         |
| Quality Food <sup>+</sup>                            | The BEI capability of ecosystems to produce vegetation grizzly bears forage for (e.g., forbs, grasses, sedges, berries), plus salmon biomass                                                                                          |
| Habitat Protection <sup>+</sup>                      | The amount of high capability grizzly bear habitat within an LU that is protected in conservation areas and wildlife habitat areas                                                                                                    |

**Note:** \* Core indicators= the primary flags for identifying potential sources of risk to grizzly bears.

<sup>+</sup> 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.<sup>14</sup> Indicators that exceed benchmarks are “flagged” and expected to represent higher risks to grizzly bear populations (Table 3.1). **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 advice. 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 or at Benchmark                      |
|                | Not Assessed: Extirpated or Never Occupied |



Increasing  
potential  
negative effects  
to grizzly bears

<sup>14</sup> Benchmarks are defined as reference points that support interpretation of the condition of an indicator or component. Benchmarks are based on our current 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 (Province of BC, 2016). Benchmarks are described for each indicator in Section 4.

## 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 commentaries interpret the meaning of the results, identify relevant contributing or causal factors, provide supporting numerical data where appropriate, and discuss limitations of the assessment. Recommendations may include further analysis or investigation that could be undertaken at the regional level to better understand the condition of grizzly bears and their habitat.

Readers are also encouraged to explore the results further within their areas of interest using provincial data sources outlined in **Appendix 3** and through the Kootenay-Boundary Region's online, interactive dashboard and web mapping tool (when available).

While the Protocol was developed by provincial subject matter experts in WLRS and the Ministry of Environment and Climate Change Strategy (ECCS),<sup>15</sup> the following assessment results and recommendations were developed by provincial and Kootenay-Boundary Regional staff from WLRS. This is a broad, landscape-level assessment that “flags” areas where management attention may be warranted.



<sup>15</sup> Provincial subject matter experts have expertise in cumulative effects assessment and/or 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.<sup>16</sup> Each GBPU is ranked to reflect the GBPU's population size and population trend (if available), genetic and demographic isolation, as well as threats to bears and their habitats (M1 to M5;<sup>17</sup> ranked highest to lowest conservation rank in terms of risk, see Morgan et al. 2019 for full details).

### 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

All GBPUs are flagged for management attention, apart from the Central Rockies GBPU, which is classified as Low conservation concern (M4). The Rocky Park Ranges, South Rockies, Flathead, Yahk, South Purcells, South Selkirk, Valhalla, and Kettle-Granby GBPUs are classified as High conservation concern (M2), and the North Selkirk, North Purcells, and Central Selkirk GBPUs are classified as Moderate conservation concern (M3) and are flagged for management attention.

These GBPUs are flagged due to cumulative effects from human disturbance, including mining activities, forestry, urban settlement and associated road development in the region. Several of these units are partially isolated from neighbouring units (South Selkirks, Yahk, and Granby) which increase conservation risk. Other units had historically high human-caused mortality, such as Rocky Park Ranges, South Rockies, Flathead, Yahk, and South Purcells, which also contributes to conservation risk. Additional information on these effects is provided below within the regional commentary on other indicators.

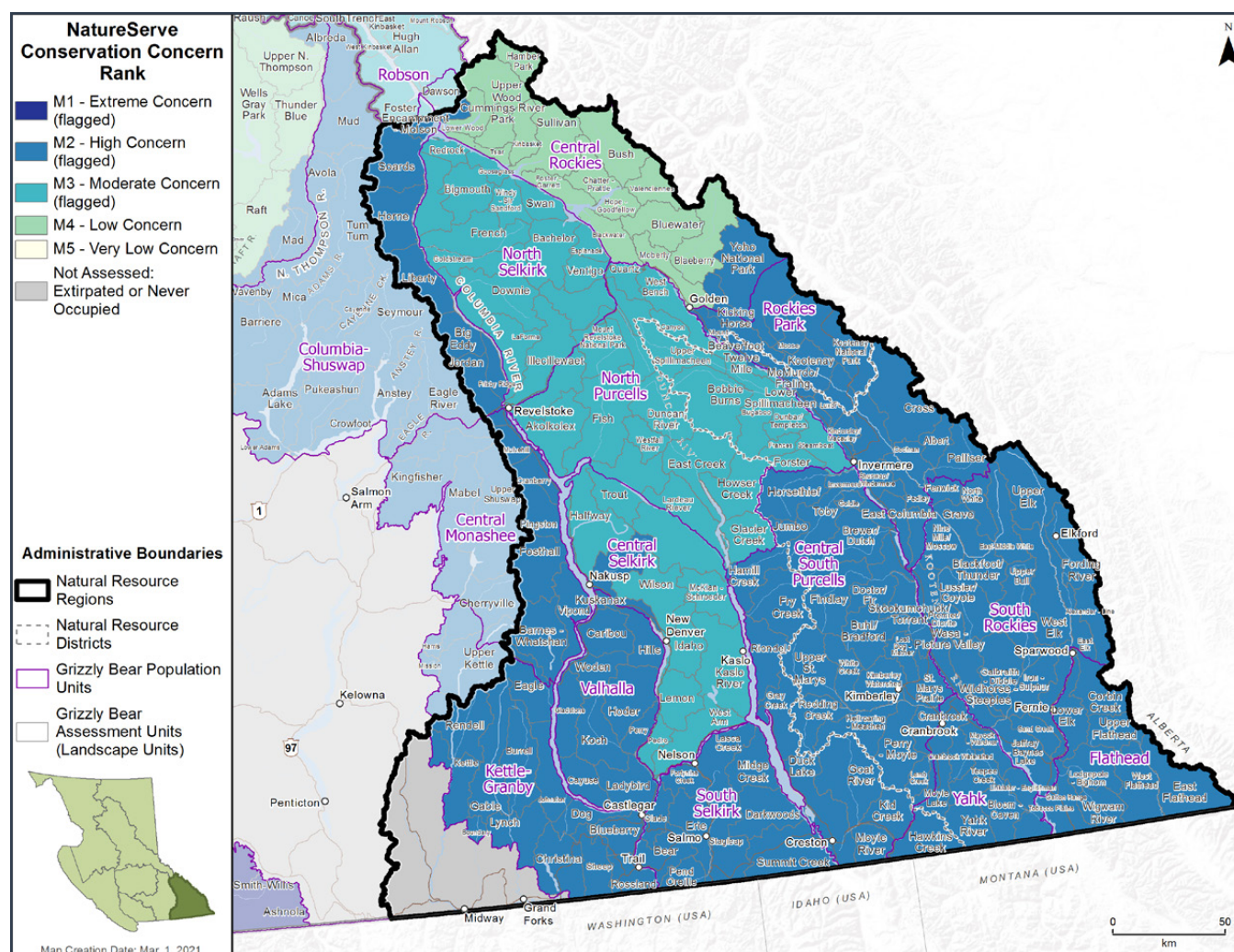
Based on the assessment results and regional knowledge, regional experts suggest that this indicator has **high** relevance, **moderate** precision and **low** utility. Rationales for these rankings are described in Table 4.1 below.

<sup>16</sup> For additional information on the NatureServe Conservation Rank Calculator, visit <https://www.natureserve.org/conservation-tools/conservation-rank-calculator>.

<sup>17</sup> 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 | Indicator Weight | Rationale                                                                                                                                                                                                      |
|-------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relevance</b>  | 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.                                     |
| <b>Precision</b>  | Low              | 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.                               |
| <b>Utility</b>    | Low              | The utility is low for this indicator because it is a composite of multiple threats which have been assessed at various scales. Ranks in some units are expected to change based on regional level assessment. |

**Figure 4.1** Conservation ranking of grizzly bear population units that overlap the Kootenay-Boundary Region. Conservation ranking was completed using NatureServe methodology.

**Note:** In Figure 4.1, some LUs will appear to have a different conservation rank than the rest of the GBPU. This occurs because the majority area of these LUs overlaps and is outside of that GBPU; therefore, the LU is assigned the rank of the neighbouring GBPU.

## 4.2 NUMBER OF BEARS – SUPPLEMENTAL

### Indicator Description:

This indicator reports the estimated number of bears per 1000 km<sup>2</sup> 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 GBPU 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<sup>2</sup> are lower risk.
- Bear densities <10 bears per 1000 km<sup>2</sup> are higher risk and are flagged; management considerations are recommended when reviewing land-based decisions in these areas.

### Benchmark:

- >10 bears per 1000 km<sup>2</sup> (not flagged)
- <10 bears per 1000 km<sup>2</sup> (flagged)<sup>18</sup>

### 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 vary throughout the Kootenay-Boundary Region (Figure 4.2). Bear densities are highest in the central portion of the region in the North Selkirk, North Purcells and South Selkirk GBPU, where the estimated grizzly bear density is >30 bears/1000 km<sup>2</sup> (Table 4.2). The Flathead GBPU in the southeast portion of the region also has a relatively high bear density, with >40 bears/1000 km<sup>2</sup>. These GBPU are currently considered to be lower risk for grizzly bears and are not flagged for management attention at this time. GBPU that are currently as low risk as the Elk Valley has proven to be rely on immigration to sustain high densities. Analysis of collared grizzly bear in the Elk Valley shows the mortality rate of grizzly bears exceeds their ability to reproduce (Lamb et al. 2020). The population exists as a “sink,” which means it only remains stable from the immigration of individuals from more secure “source” areas nearby, such as the Flathead, Bull River, portions of the Upper Elk River, Alberta, and Montana. Monitoring bear density and maintaining habitat connectivity to sustain populations is recommended.

The lowest bear density (<10 bears per 1000 km<sup>2</sup>) is found throughout the Yahk GBPU in the southern portion of the region. Bear densities are low in this area because habitat capability is low, human density is high (Cranbrook and Fernie) and road densities are high due to past forestry activities.

As mentioned in Section 2.2, certain GBPU within the Kootenay-Boundary Region overlap the administrative boundaries of other Natural Resource Regions (Table 4.2). 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.

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.<sup>18</sup>

<sup>18</sup> Benchmarks were derived from the IUCN calculator (Morgan et al., 2020)

**Table 4.2** Summary of population estimates for each GBPU that overlaps the Kootenay-Boundary Region.

| GBPU                       | Conservation Concern Ranking | Estimated Population <sup>19</sup> | Bear Density (bears per 1000km <sup>2</sup> ) | Total GBPU Area (km <sup>2</sup> ) | GBPU Area within KB Region (km <sup>2</sup> )* | % GBPU in the KB Region |
|----------------------------|------------------------------|------------------------------------|-----------------------------------------------|------------------------------------|------------------------------------------------|-------------------------|
| Central Rockies            | M4 (Low)                     | 169                                | 27.9                                          | 6,056                              | 5,859                                          | 97%                     |
| North Selkirk              | M3 (Moderate)                | 265                                | 48.9                                          | 5,421                              | 5,421                                          | 100%                    |
| Central Selkirk            | M3 (Moderate)                | 188                                | 34.5                                          | 5,450                              | 5,450                                          | 100%                    |
| South Selkirk              | M2 (High)                    | 58                                 | 14.3                                          | 4,050                              | 4,050                                          | 100%                    |
| Rockies Park               | M2 (High)                    | 116                                | 20.2                                          | 5,730                              | 5,730                                          | 100%                    |
| South Rockies              | M2 (High)                    | 170                                | 21.2                                          | 8,027                              | 8,027                                          | 100%                    |
| North Purcells             | M3 (Moderate)                | 332                                | 38.6                                          | 8,601                              | 8,601                                          | 100%                    |
| Central & South Purcells   | M2 (High)                    | 176                                | 15.8                                          | 11,162                             | 11,162                                         | 100%                    |
| Yahk                       | M2 (High)                    | 20                                 | 7.4                                           | 2,701                              | 2,701                                          | 100%                    |
| Flathead                   | M2 (High)                    | 140                                | 40.2                                          | 3,484                              | 3,484                                          | 100%                    |
| Valhalla                   | M2 (High)                    | 88                                 | 25.5                                          | 3,457                              | 3,457                                          | 100%                    |
| Kettle-Granby <sup>+</sup> | M2 (High)                    | 87                                 | 13.3                                          | 6,556                              | 5,401                                          | 83%                     |

**Note:** \* The total area excludes non-viable habitat such as water and ice (km<sup>2</sup>).

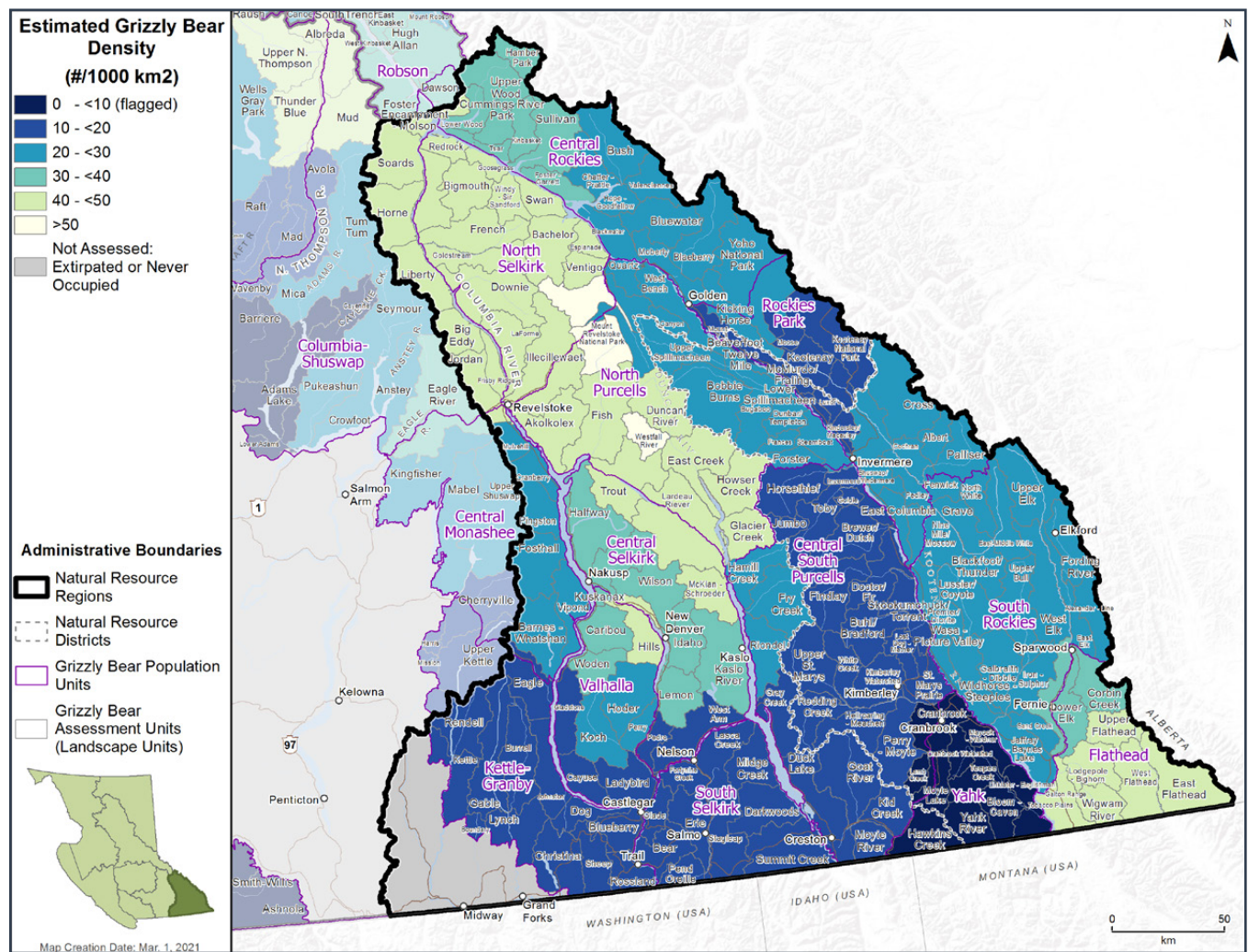
<sup>+</sup> Overlaps with Thompson-Okanagan Natural Resource Region.

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has **moderate** relevance, **moderate** precision and **low** utility. 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 | Indicator Weight | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relevance</b>  | Moderate         | Bear density as predicted by relative human activity and forage abundance is a moderately relevant indicator for population status. Density is unable to provide information on conservation risk, unless information about carry capacity is known, and this is currently lacking in the Kootenay-Boundary Region.                                                                                                                     |
| <b>Precision</b>  | Moderate         | Although there are four field-based population estimates for grizzly bears in Kootenay-Boundary 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. |
| <b>Utility</b>    | Low              | Limited data availability limits practical management response to those few areas with high-quality data.                                                                                                                                                                                                                                                                                                                               |

<sup>19</sup> Population estimates were developed in 2018 using a regression model and field-based population inventory data where available (BC MFLNRORD, 2020).



**Figure 4.2** Estimated grizzly bear density by landscape unit in the Kootenay-Boundary Region as of 2018. Landscape units that are ‘flagged’ are under a provincial mortality benchmark that is expected to highlight increased risk to grizzly bears.

## 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,<sup>20</sup> averaged over 2008 to 2017. Estimates are derived from provincial population estimates, data from the Compulsory Inspection Database (CID), and provincial estimates of unreported mortality.<sup>21</sup> 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 in the Kootenay-Boundary Region. This includes mortality from human-bear conflicts, poaching, collisions with vehicles, trains and hunting (prior to 2017).<sup>22</sup> In the CID, reported mortalities fall into the following categories: hunting, animal control (to address human-bear conflicts), illegal hunting, trapping, picked-up (grizzly bears found dead, with cause of death unspecified), road kills, and rail kills. Although the CID represents all known grizzly bear mortality, research has shown that human-caused mortality rates are much higher as many mortalities are not reported to FLNRORD (McLellan et al., 2018).

From 2008-2017, the CID-reported 683 grizzly bear deaths within the Kootenay-Boundary Region: 517 (76%) were the result of hunting, 107 (16%) the result of animal control, 14 (2%) the result of illegal hunting, 3 the result of trapping (<1%), 18 the result of rail kills (3%), and 20 (3%) the result of roadkill. Road and rail mortality is low in the region, however, road and rail networks have been increasing within the region for the past 20 years. Therefore, the actual level of mortality from road and rail kills may be higher than what is reported in the CID and should be investigated further.

Indicator results for mortality rate suggest annual bear mortality exceeded regional limits in LUs throughout the entire Kootenay-Boundary Region. A contiguous grouping of LUs are flagged within the Yahk, Central South Purcells, South Rockies, Flathead, and North Purcells GBPU in the Low-Moderate, Moderate and High categories. Groups of LUs are also flagged for management attention in the Central Rockies, South Selkirk and Kettle-Granby GBPU. These GBPU and LUs overlap numerous WMUs where hunting for grizzly bears and other species was permitted.

<sup>20</sup> 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.

<sup>21</sup> Mortality limits for each Fish & Wildlife region are established using the B.C. government's Grizzly Bear Harvest Management Procedure (BC MWLAP, 2004a). Mortality limits include known mortalities plus an estimate of unknown human-caused mortalities.

<sup>22</sup> In December 2017, the B.C. 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 has traditionally accounted for the majority of the mortality in the province.

After the grizzly hunt ban, from 2018-2019,<sup>23</sup> the CID reported 34 grizzly bear deaths within the Kootenay-Boundary Region: 23 (68%) were the result of animal control, 4 were illegal kills (12%), 2 were pick-up (6%), 2 were the result of rail kill (6%), and 3 (8%) were the result of roadkill. There were no reports of grizzly bear mortality due to hunting due to the provincial ban on grizzly bear hunting. Further investigation is required to conclude if positive effects from the provincial ban are observed and are effective in the Kootenay-Boundary region.

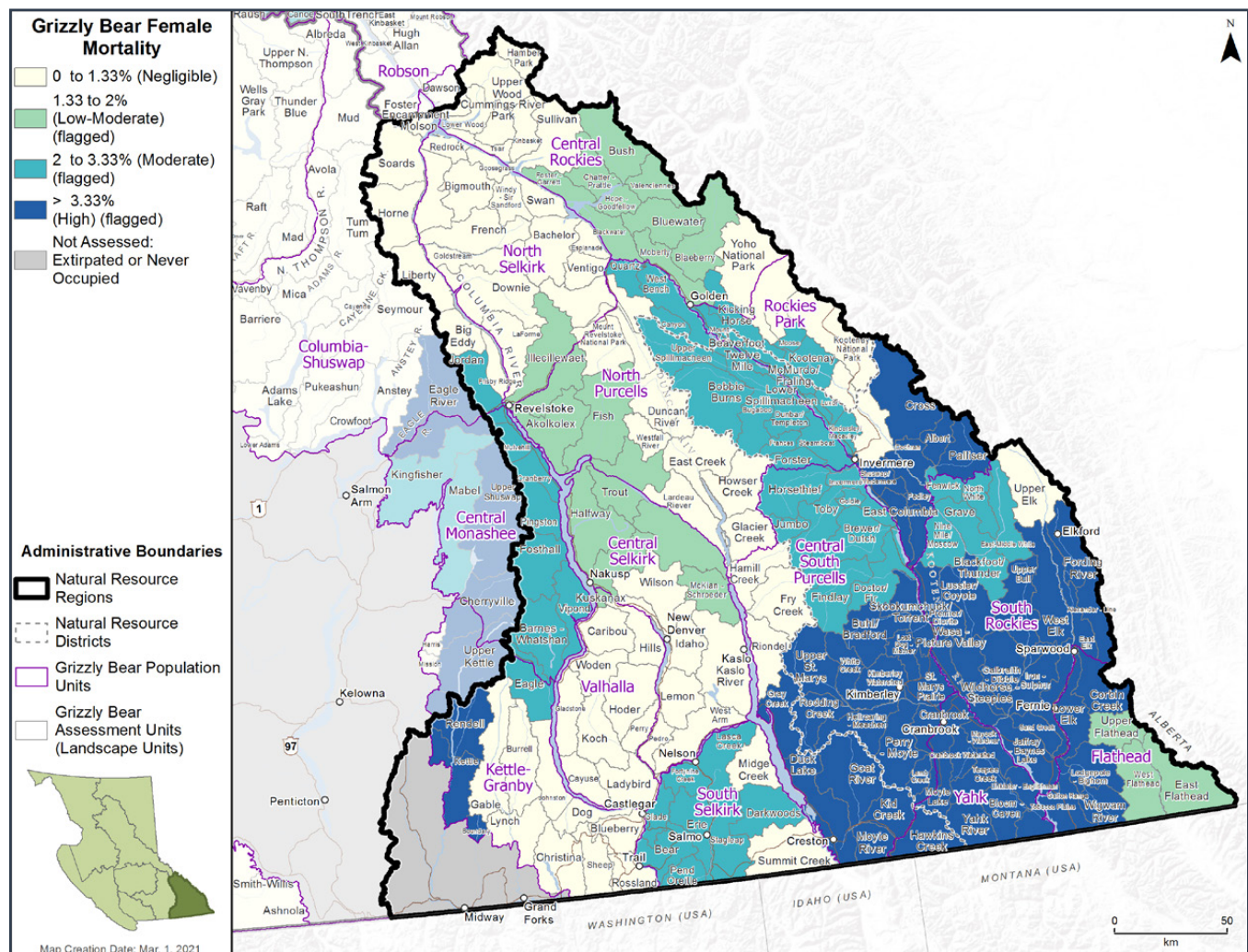
However, it is anticipated that as hunting-caused grizzly bear mortality rates drop, grizzly bear mortality due to human-bear conflicts may rise in areas occupied by farmers, ranchers, hunters, and recreationists, especially if humans continue to expand into the backcountry.

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

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

| Indicator Quality | Indicator Weight | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relevance</b>  | 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 reopens, this indicator will increase in relevance. |
| <b>Precision</b>  | 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 Kootenay-Boundary Region were hunt-based. Units with high non-hunting mortality such as the South Rockies are at greater future threat.                                                                           |
| <b>Utility</b>    | High             | Human-caused mortality is underestimated in the CID, but known mortality is tracked well through the CID, which provides good information for this assessment. Additionally, provincial monitoring programs (i.e., Fish and Wildlife) effectively integrate mortality into population modelling and use outputs to help address current bear management issues such as human-bear conflict areas and bear viewing impacts.              |

<sup>23</sup> At the time of writing this report, the CID had recorded data up to the end of 2019.



**Figure 4.3** Average annual female grizzly bear mortality rate by landscape unit in the Kootenay-Boundary Region between 2008 and 2017. Mortality rates are as recorded in the Compulsory Inspection Database and updated to include provincial estimates for unreported mortality. Landscape units that are 'flagged' are above a provincial mortality benchmark that is expected to increase risk to grizzly bears.

## 4.4 ROAD DENSITY – SUPPLEMENTAL

### Indicator Description:

This indicator reports total length of open roads<sup>24</sup> (as well as pipeline corridors, transmission line rights-of-way, and rail lines) divided by total LU area (km/km<sup>2</sup>). Most grizzly bear deaths occur within 500 metres of a road or other corridor and are the result of human-bear conflicts, illegal hunting or collisions with vehicles and trains.<sup>25</sup> Furthermore, as road density increases, displacement from key habitats near roads increases, leading to habitat loss, fragmentation, 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<sup>26</sup>

### Benchmark:<sup>27</sup>

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

### Management Context

- Managing human access (road densities and road closures);
- Managing attractants (e.g., hydro and pipeline rights-of-way, garbage dumps, camp management, access to salmon, licensed 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 are linked more closely with road density than any other indicator. Areas with high road density are generally avoided by grizzly bears as road development contributes to habitat loss and fragmentation, population isolation, and population decline over time. Areas with low road density are more favourable for grizzly bears.<sup>28</sup>

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.

The highest road densities occur in the Yahk GBPU and also occur in small portions of all other GBPU's. LUs that are flagged as >0.75 km/km<sup>2</sup> correlate directly to major highways in the region, including Highways 93 and 95, and human settlement around communities including Cranbrook, Sparwood, Fernie, and Trail.

The lowest road densities (Class 1 to Class 2) occur in the central portions of the North Purcells, Central South Purcells, and North Selkirk GBPU's and the eastern portions of the Central Rockies and Rockies Park GBPU's. These areas are either remote or are covered by parks and protected areas

<sup>24</sup> Note that this indicator does not include roads that are permanently deactivated or closed to access.

<sup>25</sup> For 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).

<sup>26</sup> 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.

<sup>27</sup> The Elk Valley Cumulative Effects Framework assess road density with the following hazard benchmarks: Low = <0.6km//km<sup>2</sup> (equivalent to Class 0, 1, 2) ; Moderate = 0.6-1.2/km<sup>2</sup> (equivalent to Class 3, 4, 5, 6 & 7 ) High >1.2/km<sup>2</sup> (equivalent to Class 4+).

<sup>28</sup> Bears do not consistently avoid roads and often select for spring forage along roadsides (Nielsen et al. 2002)" (Lamb et al. 2017).

including Glacier National Park, Purcell Wilderness Conservancy Park, Kootenay National Park and Yoho National Park.

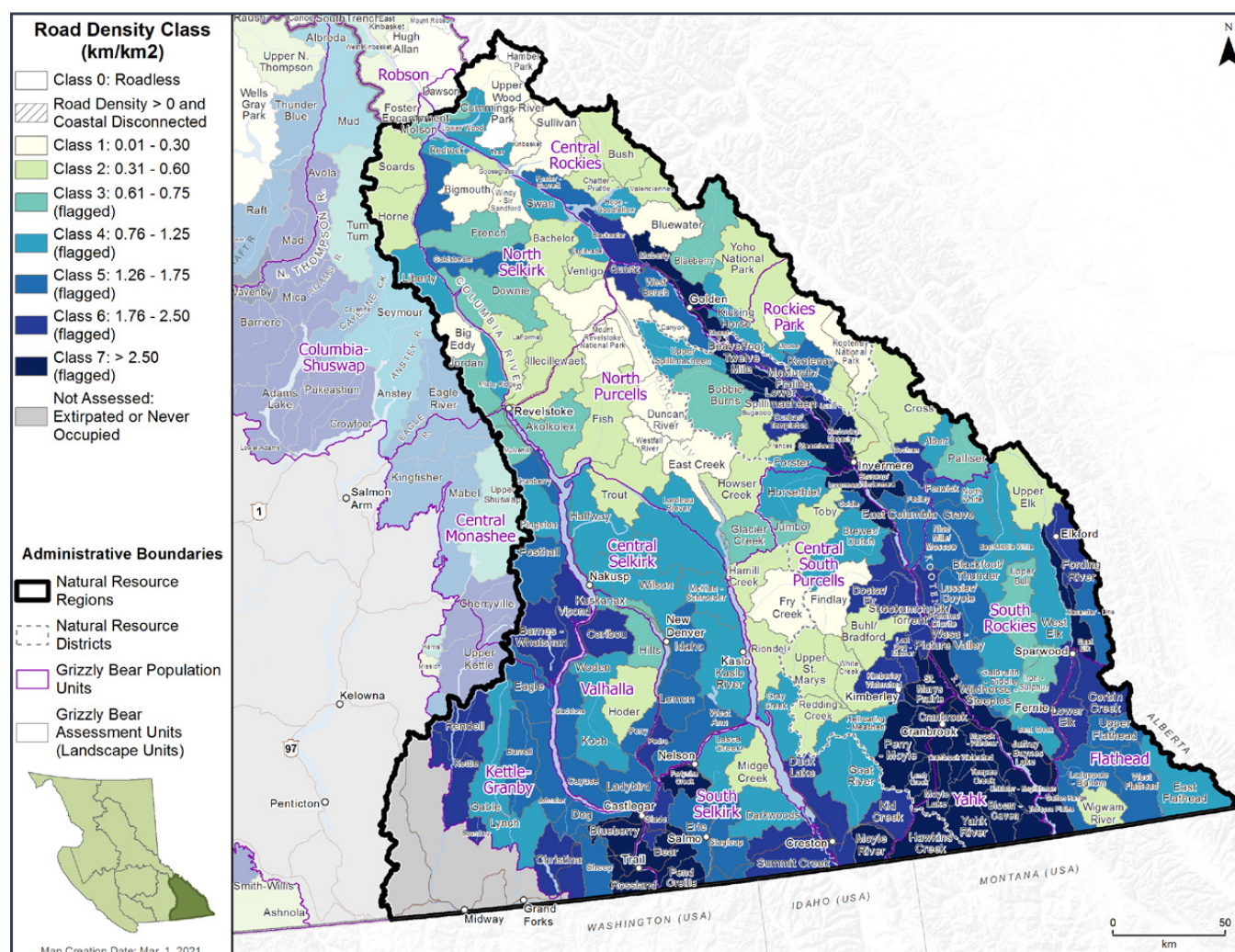
From a management perspective, high road densities around established communities such as Cranbrook, Sparwood, Fernie, and Trail should not be the primary focus of management efforts. Rather, areas with moderate or high road densities in remote areas and/or along service roads should be prioritized. Additionally, although the LUs with low road densities are not flagged for management attention at this time, it is important to acknowledge that expansion into these areas and/or temporal disturbance along these road networks have the potential to have negative effects on grizzly bears.

Findings from these assessment results for road density largely correlate to those found in the Elk Valley study area in the Elk Valley Cumulative Effects Framework. Findings from this study identified that a 0.6 km/km<sup>2</sup> road-density threshold, first identified by Mace et al. (1996), has been roughly observed as an important threshold in multiple study areas (Wakkinen & Kasworm 1997; Schwartz et al. 2010; Proctor et al. 2019, Lamb et al. 2018). Lamb et al. (2018) found grizzly bear densities to be much higher in areas where road densities were below the 0.6 threshold, even after controlling for habitat quality. Correspondingly, Lamb et al. (2018) recommended that managers, unless they have local empirical data on grizzly bear response to roads, use this as a target where grizzly bear conservation is a priority.

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

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

| Indicator Quality | Indicator Weight | Rationale                                                                                                                                                                                                                                                     |
|-------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relevance</b>  | High             | There has been significant research from the Kootenay-Boundary Region linking road density to grizzly bear population trends which makes the road density indicator highly relevant.                                                                          |
| <b>Precision</b>  | 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. |
| <b>Utility</b>    | Moderate-High    | Road access can be adjusted because most roads that impact bears are publicly owned and managed by WRSL, although access restrictions are often met with resistance by the public.                                                                            |



**Figure 4.4** Average road density by landscape unit in the Kootenay-Boundary Region in 2018. Landscape units that are 'flagged' are above a road density benchmark and expected to increase risk to grizzly bears.

## 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<sup>2</sup> 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 human disturbance, core security areas must be 500 metres or more from human infrastructure and activity.<sup>29</sup>

### 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<sup>30</sup> (not flagged)<sup>31</sup>
- < 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 Kootenay-Boundary Region are best represented in the north and central portions of the region, particularly in the Central Rockies, Rockies Park, North Purcells, and Central South GBPU. The topography of these areas is generally steep and mountainous and is part of the Rocky Mountains and Selkirk Mountain Range. These areas contain parks and protected areas, few roads, and a lack of human settlement compared to the southern portion of the region. This low level of human access results in proportionally more core security areas for grizzly bears.

The southern portion of the Kootenay-Boundary Region contains a deficit of core security. This is a result of high prevalence of human settlement, industrial development (forestry, mining), roads and infrastructure in these areas. In the Kootenay-Boundary Region, the presence of resource roads is the largest factor for core security in most LUs which offers some opportunity for mitigation.

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

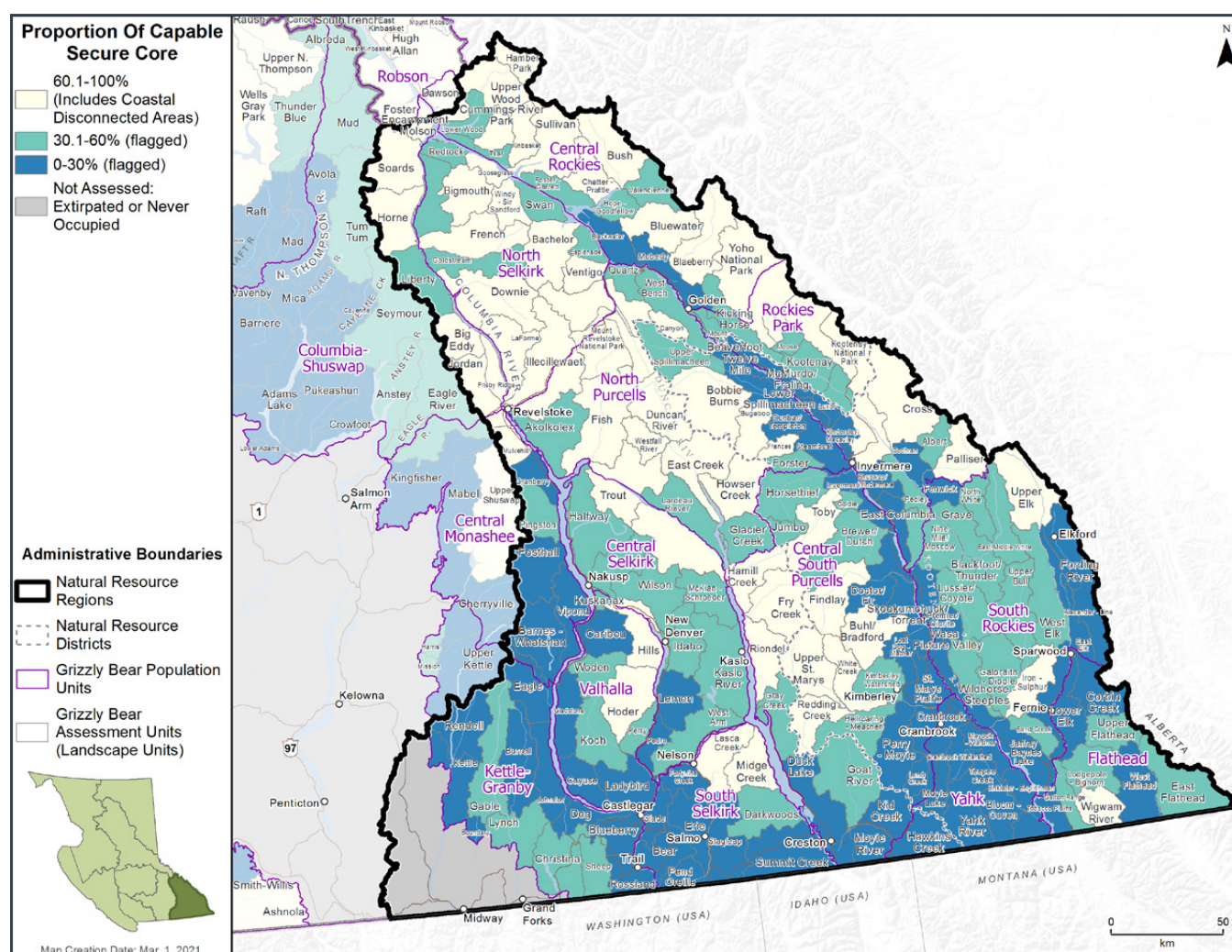
<sup>29</sup> 500-metre buffers on select human disturbance are excluded from Secure Core: mining & extraction, oil & gas, utility ROWs, agricultural, urban, urban mixed, recreation (see Appendix II tab 'meta Disturbance') or Appendix III of the Interim Assessment Protocol for Grizzly Bear in British Columbia (BC MFLNRORD & BC MOECCS, 2020).

<sup>30</sup> Capable core is areas without rock, ice and lakes that grizzly bears do not use and are away from human presence and activities.

<sup>31</sup> Science and policy from other jurisdictions recommend that secure habitat constitute 68-84% of an average female home range for long-term stability (Gilbert et al., 2004). 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.

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

| Indicator Quality | Indicator Weight | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relevance</b>  | 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.                                                                                                                                                                                                                          |
| <b>Precision</b>  | 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.                                                                                                                                |
| <b>Utility</b>    | Moderate-High    | Road density, use and clumping is an important component of this indicator (and correlates with the road density indicator) and can be adjusted as most roads that impact bears are publicly owned and managed by WRLS. If road networks expand or are evaluated in areas of high recreation pressure, then the utility of this indicator would increase. Core security can be mitigated by access planning and access restrictions. |



**Figure 4.5** Average percent capable core secure habitat for grizzly bears by landscape unit in the Kootenay-Boundary Region in 2018. Capable core secure habitat is defined as patches of habitat greater than 10 km<sup>2</sup> with minimal likelihood of human use. Landscape units that are 'flagged' are below a benchmark and expected to increase risk to grizzly bears.

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

### Benchmark:

- ≤ 20% Front country (not flagged)
- > 20% Front country (flagged)<sup>32</sup>

### Management Context

Front country decisions related to managing attractants (hydro lines, pipeline rights-of-way, dumps, camp management, access to salmon, hunter regulation for managing ungulate kills, etc.), education for private land, managing human access, and managing livestock attractant and areas.

### 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 and central portions of the Kootenay-Boundary Region contain the greatest proportions of front country (majority between 81-100%) as these areas are more populated, have forestry, mining and recreation activities, and have more road networks associated with human activities. The majority of the LUs in the region are flagged for management attention, apart from a few contiguous LUs in the Central Rockies GBPU, North Selkirk and Central North Purcells.

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 are 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 an 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, **moderate** precision, and **moderate-high** utility. Rationales for these rankings are described in Table 4.7 below.

<sup>32</sup> Benchmarks were derived from expert opinion (Tony Hamilton and other provincial grizzly bear experts).

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

| Indicator Quality | Indicator Weight | 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 Kootenay-Boundary 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. |
| Utility           | Low              | This indicator has low utility because the threshold was expert-based and the actual relationship to bears has not been tested. Also, this indicator is largely driven by human settlement, most of which is permanent and cannot be mitigated, including the roads associated with the settlement.                                 |

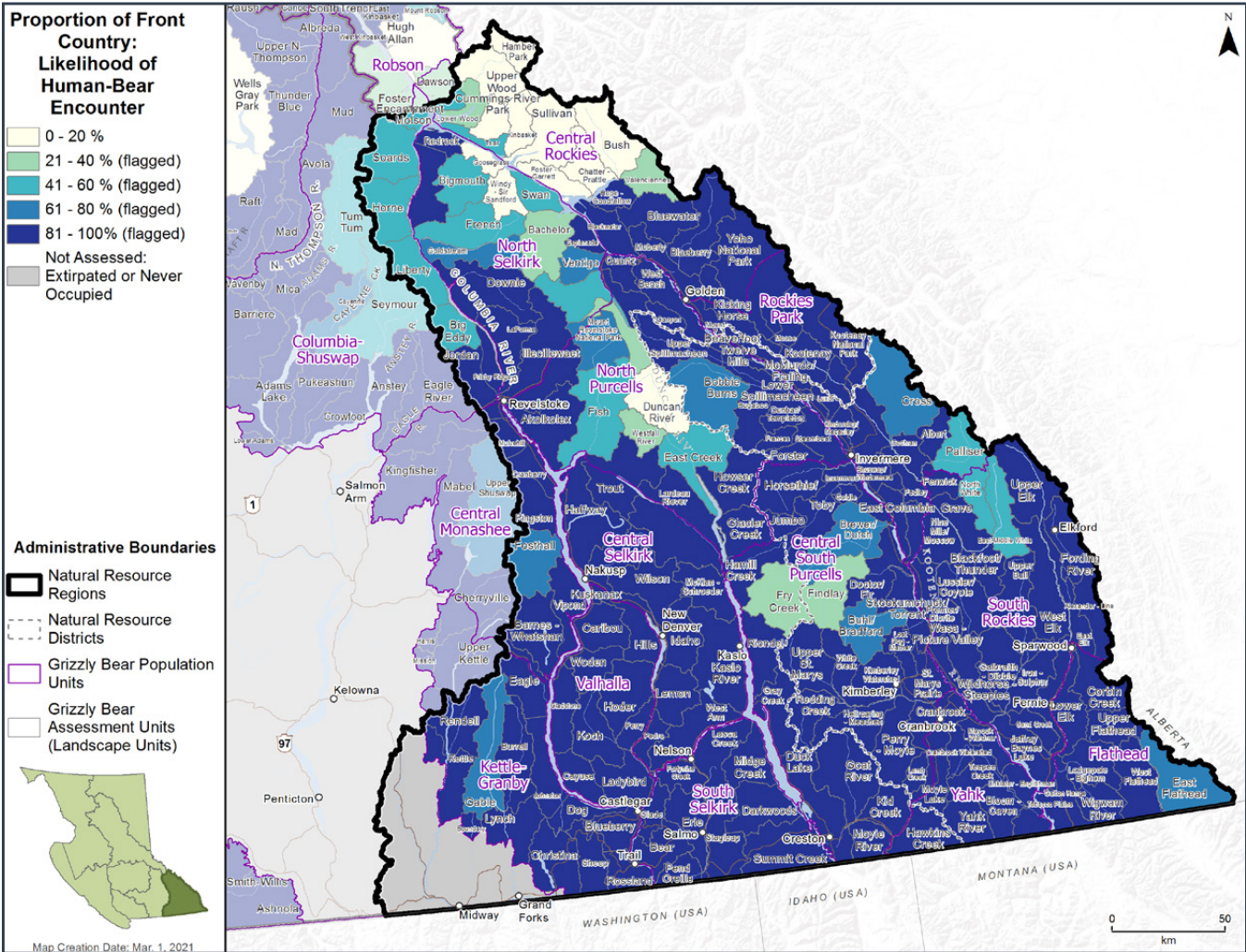


Figure 4.6 Average proportion of front country habitat by landscape unit in the Kootenay-Boundary in 2019. Front country habitat is defined by urban and rural landscapes with relatively high human density and access, and grizzly bear attractants in the form of livestock, livestock carcasses, livestock feed, fruit trees, human food/garbage and grain. Landscape units that are ‘flagged’ are above a benchmark and expected to increase risk to grizzly bears through negative encounters with humans.

## 4.7 HUNTER DAY DENSITY – CORE

### Indicator Description:

This indicator reports average annual hunter day density, which is the number of days over a 5-year period (2013-2017) per year for the occupied portion of the WMU.<sup>33</sup> This density is extrapolated to the LU level (days/km<sup>2</sup>). Hunter density can influence the amount of bear mortality due to the potential for lethal encounters with grizzly bears.<sup>34</sup> 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<sup>2</sup> are lower risk to grizzly bears
- Average annual hunter days of 0.65 – 1.87/km<sup>2</sup> are moderate risk to grizzly bears.
- Average annual hunter days greater than 1.87/km<sup>2</sup> 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<sup>2</sup>) (not flagged)
- Moderate = Quartile 3 (0.66 – 1.87 hunter days/km<sup>2</sup>) (not flagged)
- High = Quartile 4 (>1.87 hunter days/km<sup>2</sup>) (flagged)

### Management Context

Minimizing bear mortality resulting from negative encounters with hunters.

### Regional Commentary:

The majority of LUs in the southern portion of the Kootenay-Boundary Region are flagged for the hunter day density indicator. This includes all LUs in the Kettle-Granby, Valhalla, South Selkirk, Yahk, Flathead and South Rockies GBPU. Large portions of the Central South Purcells and North Purcells GBPU are also flagged for management attention. These areas correlate to the location of human settlements in the region, as well as major roads (Highways 93 and 95) and other road networks that allow access into the backcountry.

Particular LUs in the Yahk, Kettle-Granby, South Rockies and Flathead GBPU are flagged for management attention as they have a very high hunter day density (>10.00 hunter days/km<sup>2</sup>):

- 6 LUs in the Yahk GBPU: Linklater-Englishman, Mayook-Wardner, Teepee Creek, Cranbrook Watershed, Bloom-Caven, Cranbrook
- 4 LUs in the Kettle-Granby GBPU: Mission, Blueberry, Rossland, Sheep
- 14 LUs in the South Rockies GBPU: Jaffray-Baynes Lake, Sand Creek, Iron-Sulphur, Galbraith-Dibble, Upper Bull, East Elk, Fording River, Alexander-Line, West Elk, Upper Elk, Wasa-Picture Valley, Wildhorse-Steeple, Premier-Diorite, Lussier-Coyote
- 6 LUs in the Flathead GBPU: Corbin Creek, Lower Elk, Tobacco Plains, Galton Range, Wigwam River, Lodgepole-Bighorn

<sup>33</sup> 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.

<sup>34</sup> The effect of ungulate hunters on grizzly bear mortality has been documented (Haroldson et al., 2004).

These areas also correlate to other WMUs that are open to hunting for other species, including but not limited to deer, elk, moose, bighorn sheep, mountain goat, black bear, wolf, coyote, and lynx.<sup>35</sup> These species may be hunted year-round or seasonally, thereby creating a temporal disturbance on the landbase and potentially increasing the chance for human-bear interactions.

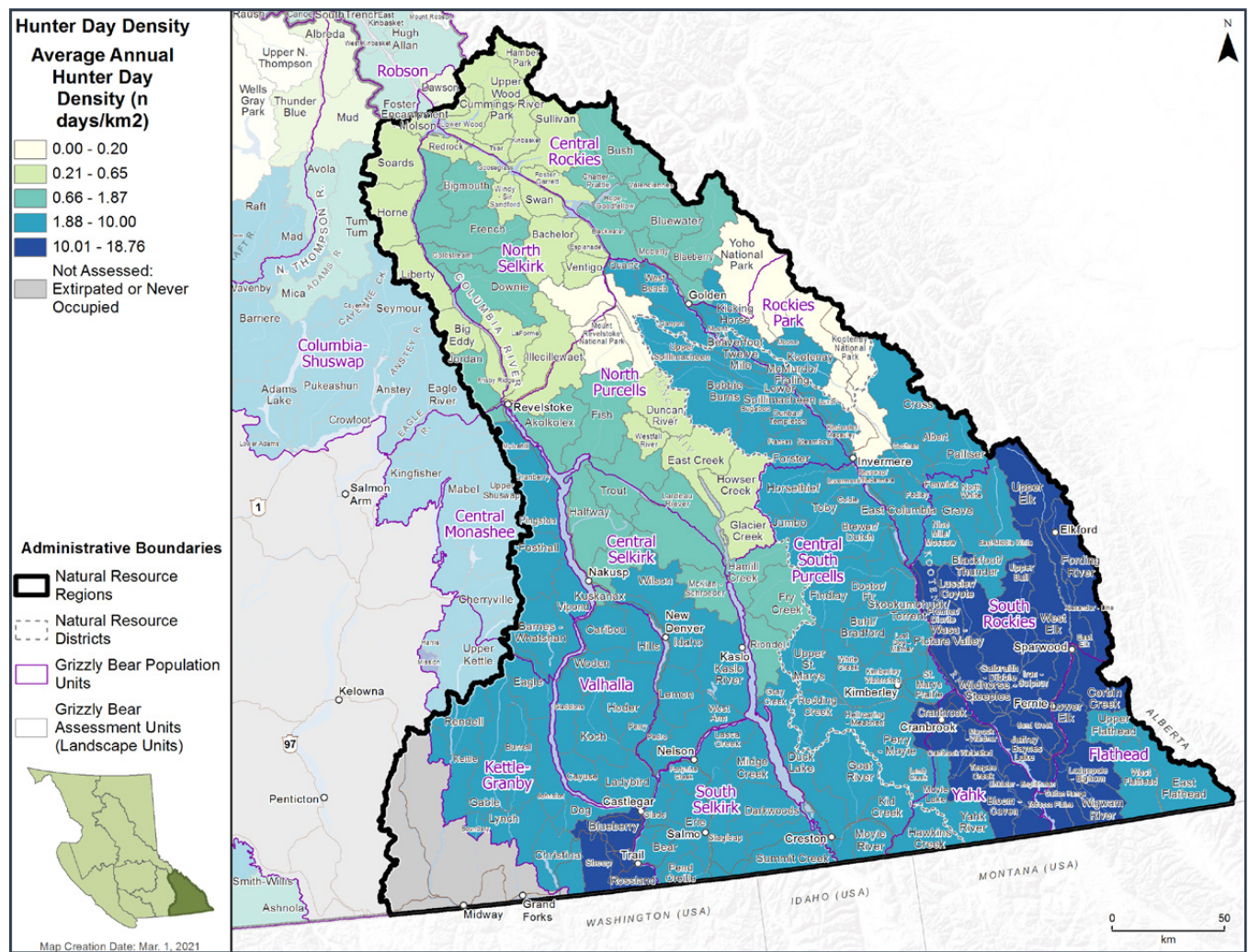
The LUs with the lowest hunter day density are Mount Revelstoke National Park (on border of North Selkirk and North Purcells GBPU), Yoho National Park (Central Rockies GBPU), and Kootenay National Park (Rockies Park GBPU), which are all protected areas where no hunting is permitted.

Based on the assessment results and regional knowledge, regional experts suggest that this indicator has high *relevance*, moderate *precision*, and moderate-low *utility*. 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 | Indicator Weight | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relevance</b>  | 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.                                                                                                                                                  |
| <b>Precision</b>  | Moderate         | The hunter day metric is calculated from the Hunter Sample Survey, which is relatively accurate in generating estimates of hunter harvest and effort. However, hunters may be present on the landbase hunting for multiple species simultaneously and may inflate reporting of hunter days in the area.                                                                                                                                                          |
| <b>Utility</b>    | Moderate-Low     | If access increases, which is currently the case, it may result in more hunters on the landbase, and the utility of this indicator will increase. A finer-scale analysis will be beneficial to show regional variation in hunting pressure based on access, which can inform mitigation measures such as access restrictions, road rehabilitation, etc., to reduce hunting pressure in key areas. For these reasons, this indicator should be closely monitored. |

<sup>35</sup> Kootenay (Region 4) Management Units and Open Season limits <https://www2.gov.bc.ca/assets/gov/sports-recreation-arts-and-culture/outdoor-recreation/fishing-and-hunting/hunting/regulations/2020-2022/hunting-trapping-synopsis-2020-2022-region4.pdf>



**Figure 4.7** Average annual hunter day density (number of hunter days per square kilometre) by landscape unit in the Kootenay-Boundary Region from 2013-2017. Landscape units that are 'flagged' are above a benchmark that is expected to increase risk to grizzly bears through negative encounters with humans.

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

### Indicator Description:

This indicator reports the amount of mid-seral<sup>36</sup> dense conifer forest within each LU; mid-seral forests represent areas that are sub-optimal for forage production potential 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  $\leq$  30% in High or Moderate BEC zones (or Low sensitivity BEC Zone) in an LU<sup>37</sup>
- High Risk = Mid-Seral Dense Conifer  $>$  30% for select BEC Zones in an LU
- Insufficient Data = VRI gap  $\geq$  10% of BEC Zone in LU<sup>38</sup>

### Management Context

- Managing forage supply (e.g., Timber Supply Review, silviculture, etc.)
- Meeting specific mid-seral objectives in some 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 Kootenay-Boundary 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 found throughout the entire Kootenay-Boundary Region. The majority of the flagged LUs are located in the southern portion of the region in contiguous LUs in the Yahk, Kettle-Granby, South Central Purcells and Flathead GBPUs. This is likely a result of historic logging, recent industrial forestry and, in some local cases, wildfires.

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

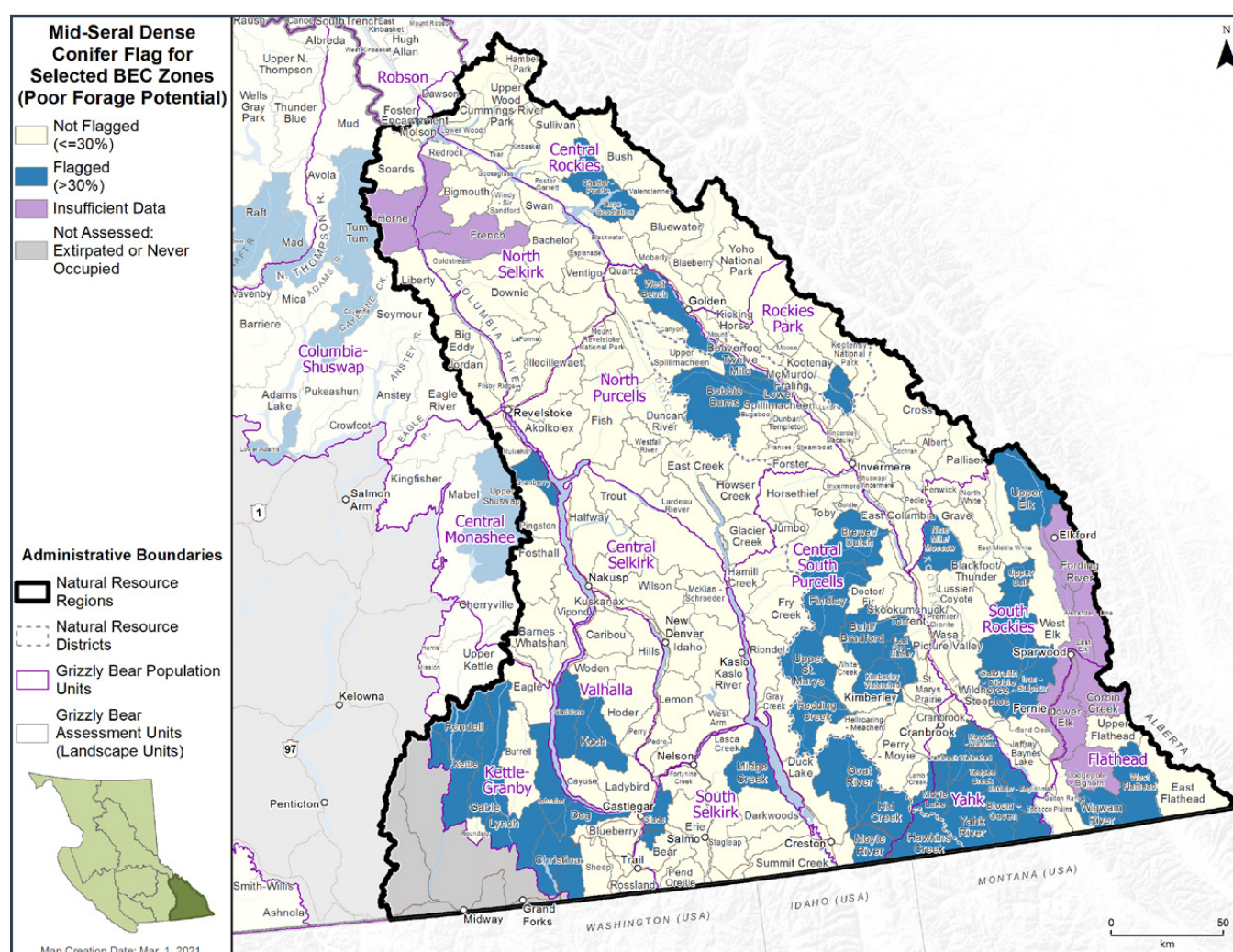
<sup>36</sup> Mid-seral dense conifer forests are typically 40 to 100 years old, depending on the ecosystem (BC MF & BC MELP, 1995).

<sup>37</sup> Landscapes with  $>$ 30% mid-seral dense coniferous forests should be evaluated for a shortage of forage and included in assessments of suitability, particularly in more sensitive ecological zones.

<sup>38</sup> Benchmarks were derived from expert opinion (Tony Hamilton, and other provincial grizzly bear experts).

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

| Indicator Quality | Indicator Weight | Rationale                                                                                                                                                                                                                                                                                 |
|-------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Relevance         | Moderate         | This indicator is moderately relevant as it is 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.                                                                                                                                    |
| Utility           | Moderate         | Due to the relatively high amount of forestry activity in associated LUs, this indicator has moderate utility for the Kootenay-Boundary Region. There are some mechanisms to protect grizzly habitat under FRPA.                                                                          |



**Figure 4.8** Percentage of mid-seral dense conifer forest by landscape unit in the Kootenay-Boundary Region in 2018. Landscape units that are 'flagged' are above a benchmark and are expected to have sub-optimal for forage production potential for grizzly bears.

## 4.9 QUALITY FOOD – SUPPLEMENTAL

### Indicator Description:

This indicator assesses the amount of quality food sources available to grizzly bears. Quality food is defined as >50% of the LU having high or very high habitat capability (BEI) and/or any unit with >10,000kg salmon biomass.<sup>39</sup>

### Interpretation Key:

- Quality forage plants are considered present if >50% of the LU is classified as high or very high capability BEI (Classes 2 and 1 respectively).
- Salmon is considered present if >10,000 kg is available at all time periods (sum of salmon kg by LU).
- Where LUs have benchmark levels of both types of quality food (>10,000 kg salmon and high or very high BEI capability for >50% of the LU), they are indicated on the results map (Figure 4.10) by a combination of solid green shading with a blue cross-hatch overlay.

### Benchmark:

- Yes – high salmon or high capability
- No – not high salmon or high capability<sup>40</sup>

### Management Context

Conservation management.

### Regional Commentary:

There is a predicted lack of quality food in the eastern portion of the Kootenay-Boundary Region, notably in most of the Rockies Park and South Rockies GBPU (Figure 4.9). This is a result of human settlement and industrial development in these areas (i.e., coal mining) that have historically and currently reduced habitat capability.

Quality food is predicted to exist in portions of the centre of the region, particularly in the North Purcells, Central South Purcells, and in portions of the Central Selkirk, South Selkirk, Kettle-Granby and Valhalla GBPU. This is likely the result of the topography (i.e., Purcells Mountain Range) and weather patterns in the western portion of the region that support quality food sources.

Huckleberries are known to limit grizzly bear density in several parts of the Kootenay-Boundary Region (McLellan 2015, Proctor et al. In Press) and soapberries and other berries are also used heavily in some years. The habitat mapping does not rate these resources accurately because these species tend to be ephemeral. Future model iterations could include species-specific resource mapping.

Additionally, there are no areas present within the Kootenay-Boundary Region that have sufficient salmon biomass >10,000 kg to support grizzly bears (Figure 4.10).<sup>41</sup> However, a grouping of LUs in the Columbia-Shuswap GBPU (located in the Thompson-Okanagan Region, west of the North Selkirk GBPU) support sufficient salmon biomass. Maintaining connectivity across the administrative boundaries of the Thompson-Okanagan and Kootenay-Boundary regions should be considered to provide grizzly bears access to salmon resources.

Alternative fish sources such as Kokanee are a locally important food source for grizzly bears in the region.

<sup>39</sup> Salmon availability averaged annually using Fisheries and Oceans Canada NuSEDS data (Fisheries and Oceans Canada, 2014).

<sup>40</sup> Benchmarks were derived from expert opinion (Tony Hamilton and other provincial grizzly bear experts).

<sup>41</sup> Salmon availability averaged annually using Fisheries and Oceans Canada NuSEDS data (Fisheries and Oceans Canada, 2014).

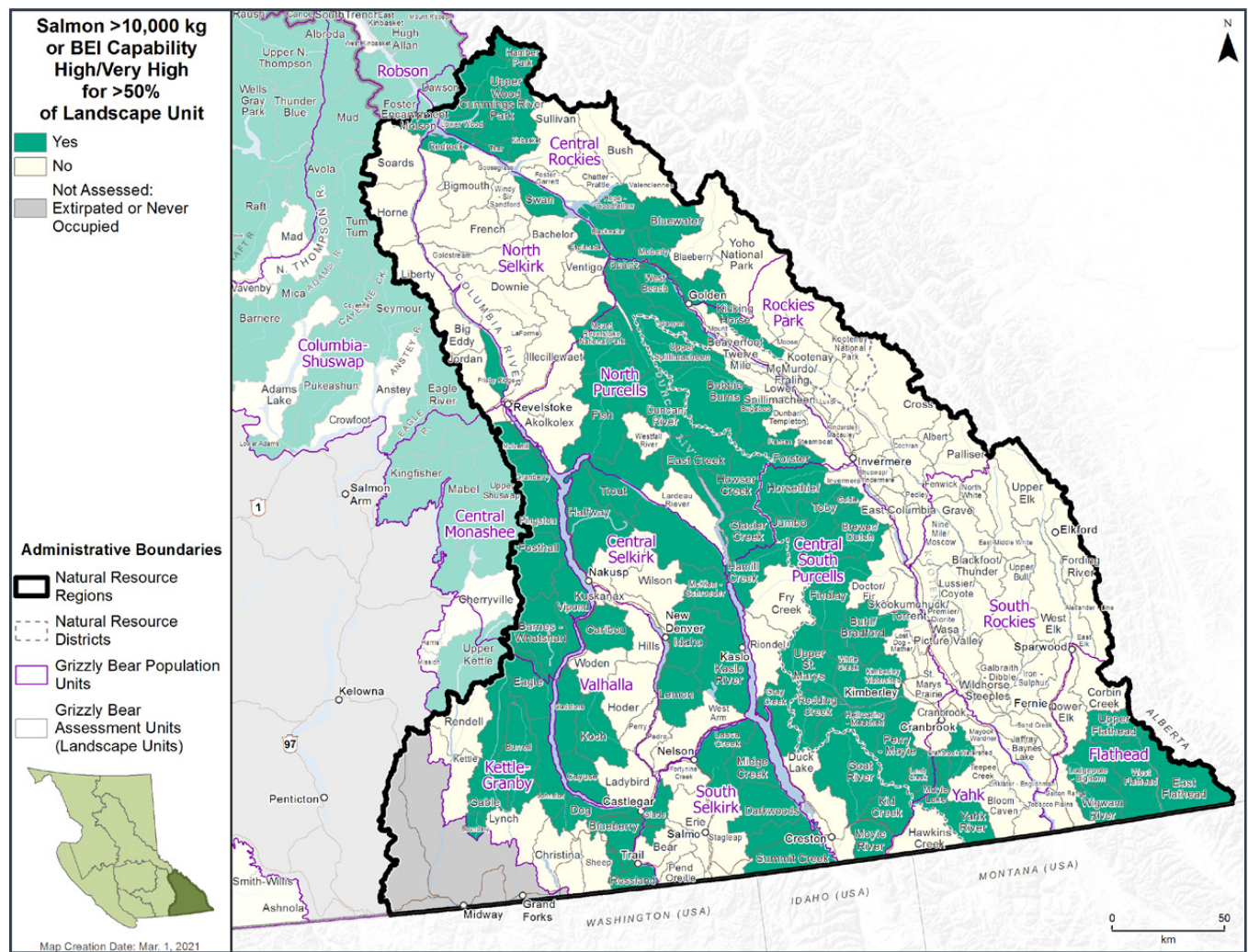
Further analysis and investigation into this indicator could include:

- 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) following Proctor and Lamb (2019).
- Incorporating more specific food maps, such as huckleberry or soapberry.

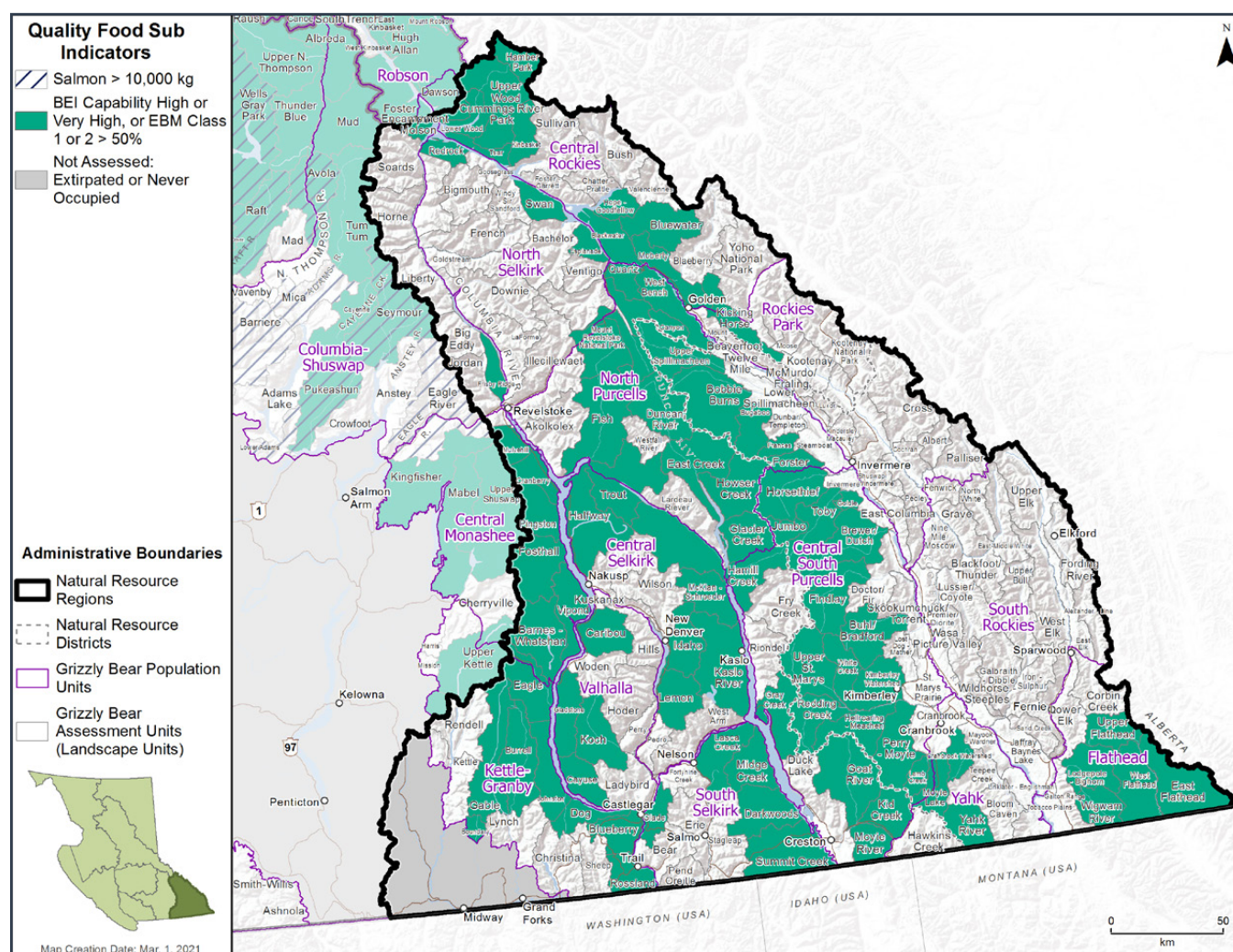
Based on the assessment results and regional knowledge, regional experts suggest that this indicator has **moderate** relevance, **low** precision, and **high** utility. Rationales for these rankings are described in Table 4.10 below.

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

| Indicator Quality | Indicator Weight | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relevance</b>  | 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.                                                               |
| <b>Precision</b>  | Low              | <p><b>Vegetation:</b> 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.</p> <p><b>Salmon:</b> There are some uncertainties and data gaps with the salmon escapement data that is used.</p>                                                                       |
| <b>Utility</b>    | High             | <p><b>Vegetation:</b> The utility is high as ecosystems will likely change at a slow rate in the future. Managing food sources can be addressed as required to reduce mid-seral footprints and enhance forage productivity.</p> <p><b>Salmon:</b> The utility is high as salmon stocks can be studied and areas can be flagged based on historical numbers of salmon. However, it is difficult to predict future salmon runs.</p> |



**Figure 4.9** Presence of quality food by landscape unit in the Kootenay-Boundary Region in 2018. Quality food is defined by >50% high or very high habitat capability and/or >10,000kg salmon biomass. Landscape units that are 'flagged' are expected to have low food availability for grizzly bears.



**Figure 4.10** Presence of quality food by sub-indicator by landscape unit in the Kootenay-Boundary Region in 2018. Quality food sub-indicators are 1) >50% high or very high habitat capability and 2) >10,000kg salmon biomass.

## 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 an LU captured within conservation areas and other designations.<sup>42</sup>
- Indicator 2: Presence/absence of Grizzly Wildlife Habitat Areas (WHA)/Specified Areas (SA) 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 low 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 high risk to grizzly bears.
- **Indicator 2:**
  - If > 0.05% of the LU comprises grizzly bear WHAs, WHAs are considered present.
  - If < 0.05% of the LU comprises grizzly bear WHAs, WHAs are considered absent.

### Benchmark:

- **Indicator 1:**
  - Low Risk = >60% protected
  - Moderate Risk = 30-60% protected
  - High Risk = <30% protected
- **Indicator 2:**
  - Yes: LU contains  $\geq 0.05\%$  WHA/EBM areas (present)
  - No: WHA/EBM areas absent or < 0.05% (absent)<sup>43</sup>

### Management Context

Conservation management<sup>44</sup>

### Regional Commentary:

Habitat may be protected through a number of measures, including parks and protected areas, wildlife management areas, old growth management areas, and WHAs for other species.

Habitat protection for grizzly bears varies throughout the Kootenay-Boundary Region. The majority of the Kettle-Granby, Central Selkirk, South Central Purcells, Yahk, and eastern portion of the South Selkirk and Rockies Park GBPU support 30 to >60% protection, and are therefore not flagged for management attention. Many parks within these GBPU, including Yoho National Park, Glacier National Park, and Purcell Wilderness Conservation Park, provide some form of protection for grizzly bears.

In contrast, southern portions of the Central Rockies, South Rockies, Flathead and western portions of the Valhalla GBPU have large areas with minimal to no protection for grizzly bear habitat and are therefore flagged for management attention. In addition to this, road closures can be an effective mitigation measure to explore as a tool to conserve grizzly bear populations and habitat.

There are a series of FRPA *specified areas* (#4-093 to 4-097 104) that have been established to protect grizzly bears. These orders are present in the western portion of the Kettle-Granby GBPU (Eagle, Rendell, Gable, Burrell and Blueberry LUs) as part of the Arrow-Boundary forest district (Figure 4.12).

<sup>42</sup> As referenced in the Grizzly Bear Protocol – Appendix 2 Data Dictionary (BC MFLNRORD & BC MOECCS, 2020).

<sup>43</sup> Benchmarks were derived from expert opinion (Tony Hamilton and other provincial grizzly bear experts).

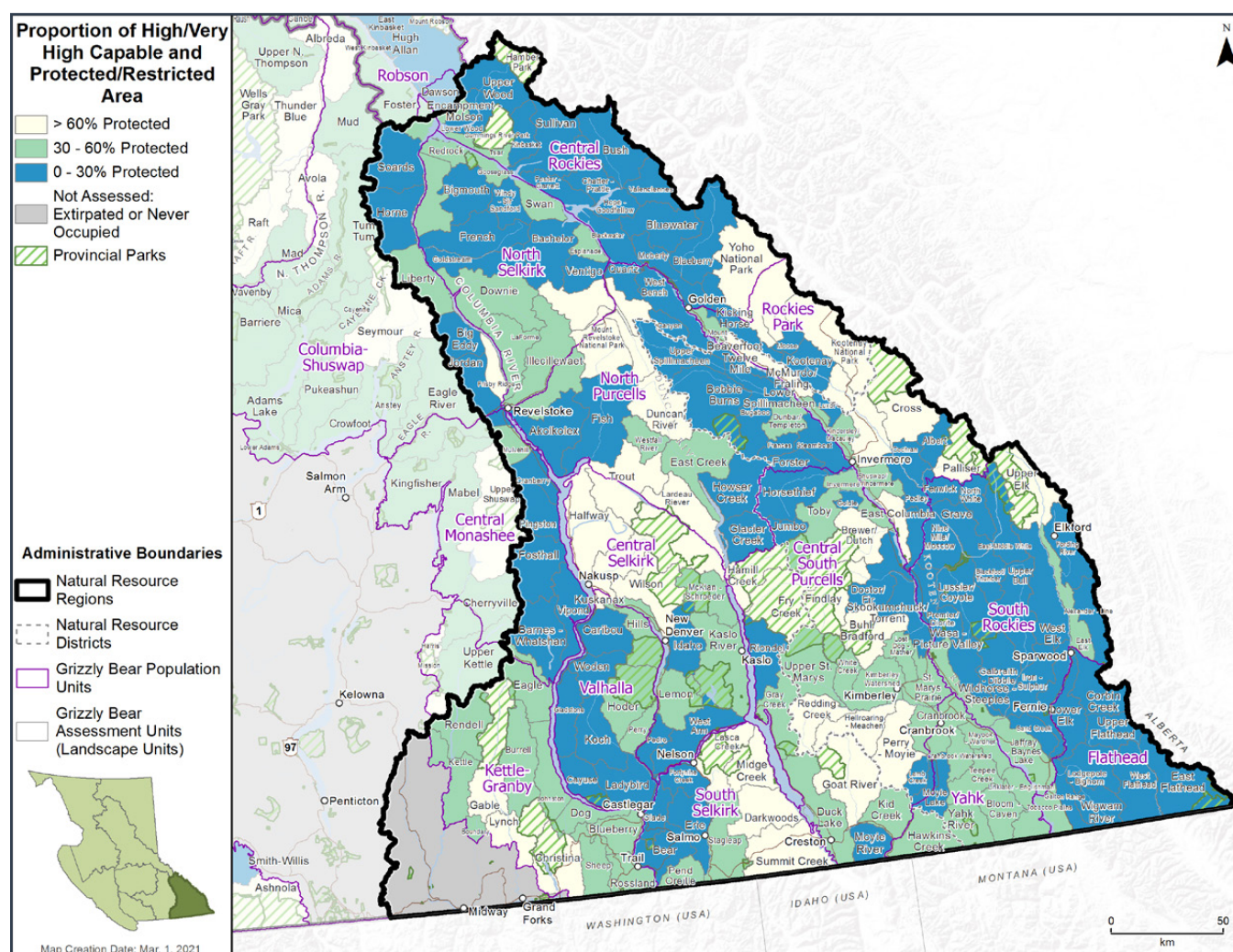
<sup>44</sup> WHAs/SA only address forestry and range threats and not other threats – e.g., recreation, residential, some transportation.

A WHA also exists in the Yahk GBPU (4-108) to protect grizzly bear habitat. Additional WHAs and other protected areas should be established in areas that have both quality food and habitat resources to support grizzly bear populations. In addition to this, road closures can be an effective mitigation measure to explore as a tool to conserve grizzly bear populations and habitat.

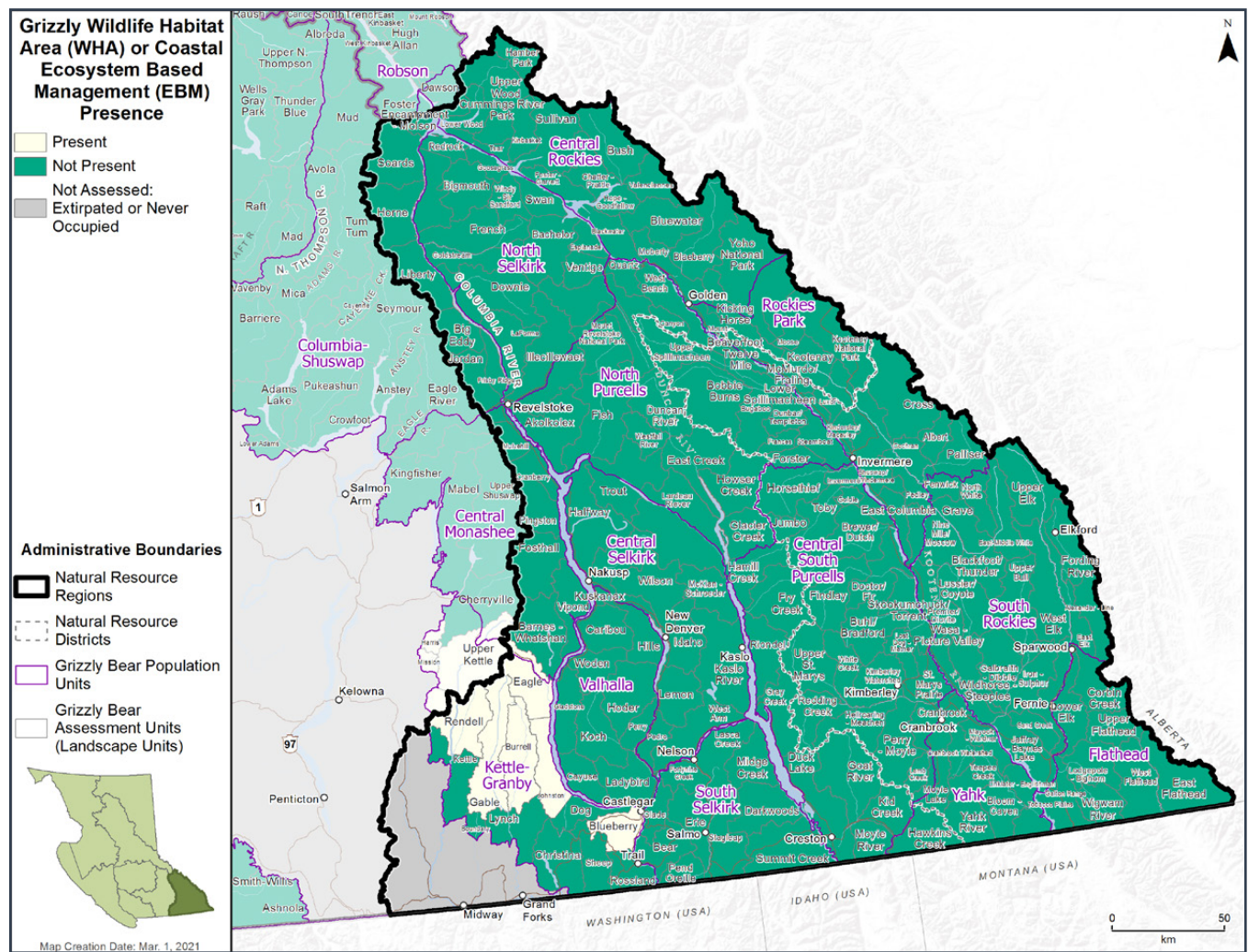
Based on the assessment results and regional knowledge, regional experts suggest that this indicator has **moderate** relevance, **low** precision, and **low** utility. Rationales for these rankings are described in Table 4.11 below.

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

| Indicator Quality | Indicator Weight | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relevance</b>  | 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). This indicator also has moderate relevance as the region has focused efforts on access management/restricting access to areas instead of establishing WHAs. |
| <b>Precision</b>  | 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. Further key species are not specifically mapped.                                                                                                                                                                                                                                                                                                                      |
| <b>Utility</b>    | Low              | Current indicator resolution is too coarse to guide clear effective management response for the Kootenay-Boundary Region. Need to be able to better identify where there is quality habitat with little management/protection.                                                                                                                                                                                                                                                                                                                                                         |



**Figure 4.11** Quality Habitat Protected – Kootenay-Boundary Region



**Figure 4.12** Average proportion of high or very high capability grizzly habitat that is protected by parks or other landscape designations in the Kootenay-Boundary Region as of 2018. Landscape units that are 'flagged' are below a benchmark and expected to increase risk to grizzly bears.

# 5 CONCLUSION & NEXT STEPS

Grizzly bears are susceptible to cumulative impacts on their populations and habitat from land use activities and disturbances. Within the Kootenay-Boundary 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 & RECOMMENDATIONS

### Grizzly Bear Conservation Concern Rank and Abundance

Grizzly bear **conservation concern ranks** are flagged for management attention across Kootenay-Boundary Region, apart from the Central Rockies GBPU, which is classified as Low conservation concern (M4). The Rockies Park, South Rockies, Flathead, Yahk, Central South Purcells, South Selkirk, Valhalla, and Kettle-Granby GBPU are classified as High conservation concern (M2), and the North Selkirk, North Purcells, and Central Selkirk GBPU are classified as Moderate conservation concern (M3). These rankings are likely conservative because there are many mitigations underway in these units that reduce conservation risk, such as long-term annual population monitoring (Flathead, South Rockies, Yahk, Purcells, and South Selkirks), important private conservation lands conservation lands (Flathead, Yahk, Purcells, and South Selkirks), grizzly bear targeted access closures (Flathead, South Rockies, South Selkirks and Granby), and considerable reduction in human-caused mortality due to the closure of the hunt in 2017 (Rocky Park Ranges, Flathead, and South Selkirks). We suggest the rankings in these units are re-evaluated using local information about grizzly bear risk.

**Bear densities** are highest in the Flathead GBPU with >40 bears/1000 km<sup>2</sup>. Bear densities are also relatively high throughout the central portion of the region in the North Selkirk, North Purcells and South Selkirk GBPU, where the estimated grizzly bear density is >30 bears/1000 km<sup>2</sup>. These GBPU are currently considered to be lower risk for grizzly bears and are not flagged for management attention at this time. The lowest bear density (<10 bears per 1000 km<sup>2</sup>) is found in the Yahk GBPU in the southern portion of the region. Flags within these LUs in this area are due to the inherently low habitat quality in the unit.

### Human Presence and Activities

Human activities and presence have the potential to pose a threat to grizzly bears in the Kootenay-Boundary Region. The extent of human presence, access, and expansion is apparent in the southern and central portions of the region where the **front country and core security** indicators are flagged. The majority of the LUs are flagged for front country at the highest proportion of 81-100%. This also correlates with core security, as similar LUs within the central and southern portions of the region are flagged for management attention, given their proximity to human settlement, road networks and other human activities.

The front country and core security indicators are highly dependent on road density. Therefore, prioritizing the management of road density within the region will help to improve front country and core security as well.

**Mortality** is flagged in LUs throughout the region but is highest in the southeastern portion of the region in the Yahk, South Rockies, Central South Purcells, and Flathead GBPU. These LUs are within or adjacent to human settlement, including the communities of Cranbrook, Sparwood and Fernie, and also have relatively high human activities, including forestry, coal mining, recreation activities, and associated road networks. Mortality is also flagged along highways and roads that connect these cities, including Highways 93 and 95 where **road density** is highest and flagged for management attention. With the grizzly bear hunt now closed, the greatest source of grizzly bear mortality will likely be the result of human-bear conflicts in front-country areas. Conflict reduction programs such as BCWildSafe are known to reduce conflict and are recommended in areas of high conflict.

The **hunter day density** indicator is also flagged in areas throughout the southern and central portion of the region where humans are present and access in the region occurs. Managing hunter days is only likely possible using access management.

### Habitat Quality & Protection

In general, the Kootenay-Boundary Region supports moderate to high-quality habitat for grizzly bears. Only a few LUs have been flagged for **mid-seral dense conifer** (>30%) throughout the region.

Various grizzly bear habitat protection measures are in place throughout the Kootenay-Boundary Region in the form of provincial parks and protected areas, wildlife management areas, wildlife habitat areas land and resource management plans, and through provincial Acts, policies and strategies (see Section 2.2).

The majority of the Kettle-Granby, Central Selkirk, South Central Purcells, Yahk, and eastern portion of the South Selkirk and Rockies Park GBPU support 30 to >60% **habitat protection** and are therefore not flagged for management attention. Many parks within these GBPU, including Yoho National Park, Glacier National Park, Purcell Wilderness Conservation Park, provide some form of protection for grizzly bears. In contrast, southern portions of the Central Rockies, South Rockies, Flathead and western portions of the Valhalla GBPU have large areas with minimal to no protection for grizzly bear habitat and are therefore flagged for management attention.

Establishing GARs or WHAs for grizzly bears in areas that have high habitat capability and quality food capability may want to be considered in the future. In the immediate term, evaluating road access and restricting access may be the most effective tool to enhance grizzly bear populations and habitat.

### Quality Food Sources

Overall, the Kootenay-Boundary Region has relatively good **quality food** sources for grizzly bears. While anadromous salmon is not available in the region, other food sources, such as vegetation, berries and kokanee, are available and utilized by grizzly bears when available.

While food sources and habitat for grizzly bear currently exist in the Kootenay-Boundary 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. The large number of forest fires in the recent past will create much new or higher quality habitat for grizzly bears. Bears have already begun to use some of these burns in some places. 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:**

- Monitor population trend in areas of high conservation risk, especially when that risk is related to factors that cannot be easily measured, such as unreported human-caused mortality.

- **Mortality Rate:**

- Identify where hunt opportunities were historically reduced in the past to remain within sustainable levels to understand where mortality levels were close to being exceeded. This may inform future land use proposals in the region.
- Conduct further research to better understand and/or track road and rail mortality in the region.

- **Road Density:**

- Further refine the analysis to include weighting roads by different levels of accessibility across the Kootenay-Boundary Region.
- Enhance the quality of roads datasets used in this analysis to help improve and refine assessment results in the future.

- **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.

- **Front Country:**

- Develop a road use density indicator to further understand human access and to determine how roads are being used by humans (e.g., motor vehicle use may have a higher degree of impact on grizzly bears compared to hikers).

- **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 assessment for consideration in their decisions.
- Incorporate berry mapping, burn intensity mapping, and seral stage maps to improve the assessment on forage potential.
- Investigate the recovery of key foods such as berries in cutblocks and burns, including better understanding of whether there are silvicultural treatments that can improve bear food production.
- Incorporate bear food into Timber Supply Reviews in order to better manage food supply and quality.

### • **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 additional 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).

### • **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 Kootenay-Boundary Region.

### Reducing Risk to Populations and Habitat

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

- 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;
- Addressing expansion of humans into remote/backcountry areas;
- Establishing grizzly bear GAR orders 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 could offer additional protection to grizzly bears now and in the future;
- 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) and limit future disturbance by removing in-block and spur roads as soon as development is finished.
- Adjusting best practices for development project and activities to mitigate project impacts to grizzly bear populations and habitat; and
- Mitigating and reducing human-bear conflict by educating local communities on bear-smart initiatives (e.g., WildsafeBC, Bear Hazard Assessments).

### Validation and Ground-Truthing

As this is a Tier 1 (GIS-based) assessment, validation of assessment results should be conducted within flagged LUs to verify/ground truth results to determine the amount of risk that exists and what type of management responses could be taken to reduce risks.

### Research, Inventory and Monitoring

There has been more research and inventory of grizzly bear populations in the Kootenay-Boundary Region than any other region in B.C. Several of these projects are ongoing, such as the Flathead project which began in 1978 and is the longest running grizzly bear research project in Canada. Other monitoring projects are cooperatively run between the provincial government, First Nations and ENGOs. These monitoring projects provide managers with a direct measure as to how the local grizzly bear population is doing.

Resource managers should consider conducting or continuing ongoing research, inventory, and monitoring efforts to refine understanding of grizzly bear populations, density, habitat use, diet, and threats, especially in LUs flagged as high risk to grizzly bears due to insufficient core security area, high hunter and road densities, and inadequate quality habitat protected.

Additionally, resource managers should also consider repeating this assessment or a similar cumulative effects assessment on a regular basis within the region. These assessments are GIS-based



and provide an approximation of the status of values across a spatial area based on the effects of multiple activities on the landbase. For grizzly bears, these assessments can inform if population and habitat effects or risks are present, and over time, temporal trends of values across the landscape can be compared. The results of these assessments can inform where additional research, inventory and monitoring is required and can inform resource management practices, including land use planning.

### Supporting Future Current Condition Assessments

Continuing to monitor the current condition of grizzly bears in the Kootenay-Boundary 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.

Rerunning 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 reassessment 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 Kootenay-Boundary 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 (and other fish species) for grizzly bears in the Kootenay-Boundary Region.

### Government Decisions and Plans

Recent government decisions to develop a provincial grizzly bear management plan, to close the licensed grizzly bear hunt, revise the *Forest Renewal and Practices Act*, and to modernize certain land use plans will be instrumental in providing additional management actions and considerations for land use decision-makers.

Additionally, work is underway to modernize land use planning, which may provide an opportunity to add management actions and considerations for land use decision-makers.

### Coordination with Neighbouring Regions

An opportunity exists for the Kootenay-Boundary Region to facilitate coordinated management planning with the Thompson-Okanagan Region for the Kettle-Granby, Central Monashee and Columbia-Shuswap GBPU. In the Kettle-Granby GBPU, extensive research, a Forest Practices Board investigation, and the Chief Forester have all recommended efforts to recover imperilled grizzly bear populations by reducing road density in areas of suitable grizzly bear habitat.

Coordinated management is also warranted with the province of Alberta and the United States where GBPU and LUs overlap.

### Alignment with other Assessments

Grizzly bears were also a valued component in the Elk Valley Cumulative Effects Framework.<sup>45</sup> In this assessment, spatial and non-spatial data were used to assess historic, current, and potential future conditions, as well as develop hazard maps. Three alternative future scenarios, namely, business as usual, minimum development, maximum development, and a higher natural disturbance scenario were defined to assess the response on indicators over the next 50 years.

Though assessed at a smaller spatial scale, the results of the Elk Valley CEMF assessment for grizzly bear are consistent with findings from this current condition assessment, namely, that high road densities create significant hazard for grizzly bear now and into the future and that habitat availability and suitability declines over time.

For more details on the indicators and methodologies, see EV CEMF (2018a and b).

### Assessment of Future Trends

Future environmental and industrial trends will be important to consider when determining next steps for managing grizzly bear populations and habitat in the assessed GBPU, including but not limited to:

- **Past logging and large wildfires** – will create more closed-canopy conifer forests in future, which are not suitable grizzly bear habitat;
- **Urban and agricultural areas, natural resource industries (especially energy), and backcountry recreation** – anticipated growth of these areas and industries in the region will further diminish viable grizzly bear habitat, especially in already imperilled and vulnerable GBPU in proximity to major southern interior centres; and
- **Climate change** – the effects of climate change on grizzly bears is uncertain, but the combined effects of industrial and urban expansion and climate change will likely increase grizzly bear mobility (in search of food) and, consequently, potential for human-bear conflicts.

### Additional Indicators to Explore – Berry Layers

A number of specific food layers were created for the Kootenays and beyond over the last few years.

Exploring additional food layers will help improve the understanding of the availability and the types of quality foods that exist for grizzly bears. Initial spatial mapping of berries like huckleberry, saskatoon berry, soapberry, various blueberries, and other berries is in progress. This information may be incorporated into future cumulative effects assessments in collaboration with First Nations.

The documentation for these layers is currently limited and needs work. These layers have been used to plan or prioritize access management across southern B.C.

A comprehensive review of grizzly bear diet can be found here (MacHutchon 2021): <https://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=59121>, including some documentation.

<sup>45</sup> For more information, visit <https://www2.gov.bc.ca/gov/content?id=20C6588FB69B4F59AC55BB83B5FDD2A6>

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# 7 APPENDICES

## APPENDIX 1 – GRIZZLY BEAR OBJECTIVES AND LEGAL PROTECTION

In B.C. and the Kootenay-Boundary 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 Kootenay-Boundary 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 Kootenay-Boundary 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 GBPU's or in GBPU's with low bear population densities (i.e., the number of bears per 1000 km<sup>2</sup>).<sup>46</sup> 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.

<sup>46</sup> 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.<sup>47</sup>

### **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 Kootenay-Boundary 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 Kootenay-Boundary 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:

- Conserving productive and/or critical feeding and breeding habitats;
- Using regional connectivity corridors to provide dispersal corridors between population units;
- Using timber harvesting and silvicultural methods that sustain food production;
- Setting road densities and objectives by managing access by designated units; and
- Manage core grizzly bear areas for high densities to encourage emigration.

**A full list of the land use plans in the Kootenay-Boundary Region can be found here:**

<https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/kootenay-boundary>

<sup>47</sup> 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 Kootenay-Boundary 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

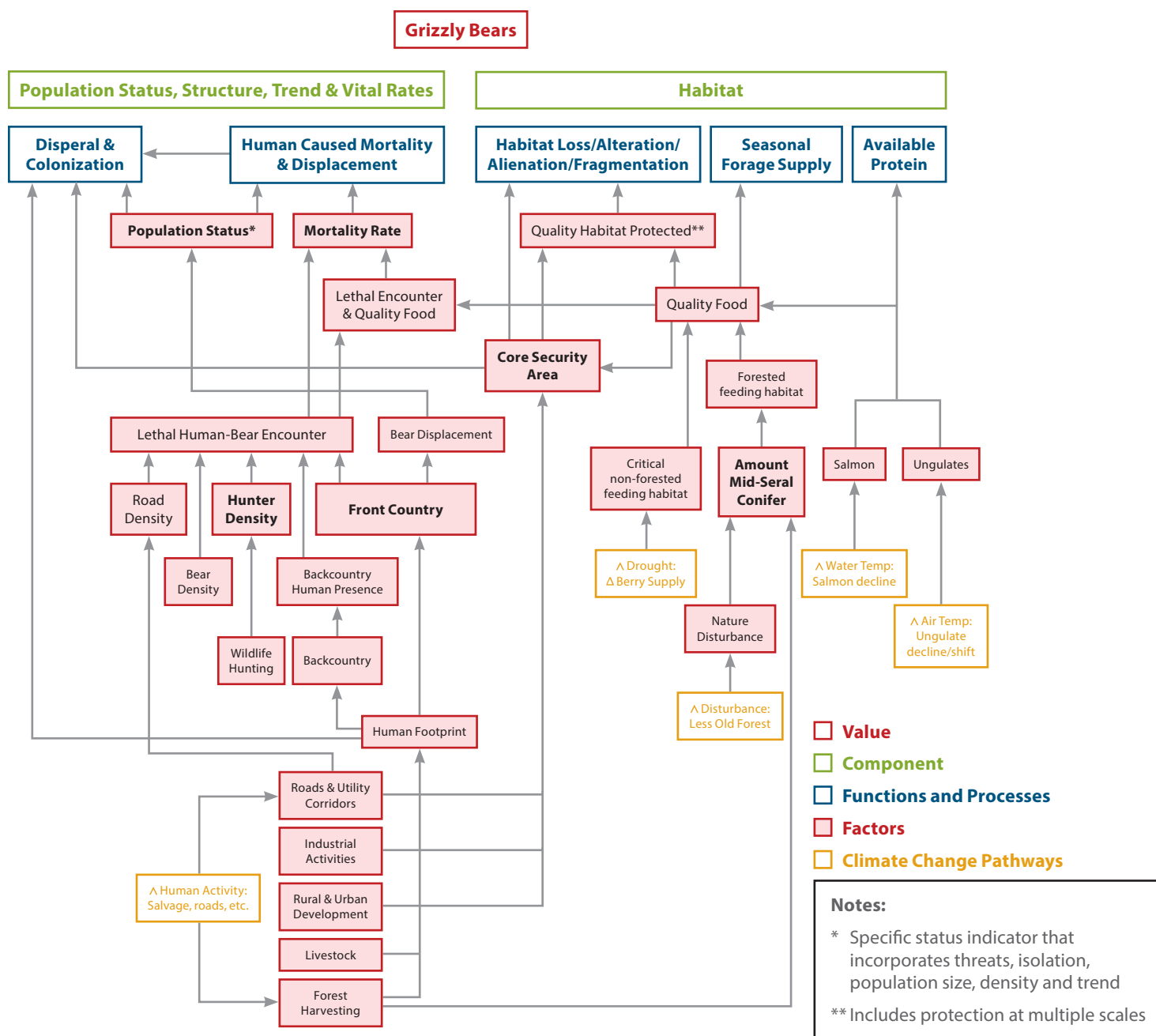
The following reports provide additional information or insights into the current condition of grizzly bears:

- 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)<sup>48</sup> 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.



<sup>48</sup> The **bolded** factors (population status, mortality rate, hunter density, front country, core security area, and amount mid-serai 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 – DATA

Please see Appendix II of the Interim Assessment Protocol for Grizzly Bears in British Columbia and the British Columbia Data Catalogue for the dataset and metadata used in this assessment.

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



Ministry of  
Water, Land and  
Resource Stewardship

**CEF** Cumulative  
Effects  
Framework