



Current Condition Report for Grizzly Bear in the Northeast Region 2015 Analysis

Northeast Natural Resource Region

Ministry of Forests, Lands, Natural Resource Operations and Rural
Development & Ministry of Environment and Climate Change Strategy

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Note

The information contained herein is identical to that contained in the ArcGIS Online Report found here:

<https://governmentofbc.maps.arcgis.com/apps/MapJournal/index.html?appid=5e203456b6254d67a8218e419b070e46>

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List of Acronyms

BC	British Columbia	LEH	Limited Entry Hunt
BEC	Biogeoclimatic Ecosystem Classification	LU	Landscape Unit
BEI	Broad Ecosystem Inventory	LUO	Land Use Order
CEF	Cumulative Effects Framework	LUP	Land Use Plan
CID	Compulsory Inspection Database	TEM	Terrestrial Ecosystem Mapping
COSEWIC	Committee on the Status of Endangered Wildlife in Canada	WHA	Wildlife Habitat Area
FRPA	<i>Forest and Range Practices Act</i>	WMU	Wildlife Management Unit
GBPU	Grizzly Bear Population Unit		

1 Introduction

British Columbia is committed to sustainable resource management. As resource demands grow, we must be able to measure the effects of all natural resource activities, large and small, on the values important to the people of British Columbia. To meet this need, the provincial government established a [Cumulative Effects Framework](#) (CEF) in 2014 to guide the assessment of cumulative effects¹ across natural resource sectors, and the integration of assessment results into natural resource decision-making.

As part of the CEF, government carried out a provincial assessment of the current condition of several resource values of importance to British Columbians (old growth, aquatic ecosystems and grizzly bears) in 2015, using indicators for each value that illustrate the cumulative effects of natural resource activities on those values.

This report provides an overview of the current condition of grizzly bears in the Northeast region of BC, using an assessment 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 the grizzly bear's ecology and habitat requirements, threats to its 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 in the Northeast region, including any limitations of the assessment;
- results for each indicator, including descriptive maps, interpretation of those maps, and links to further detailed maps and data;
- a summary of the results and key contributing factors influencing the results;
- a summary of other information on the current condition of grizzly bears in the Northeast; and
- based on the results outlined in this report, a summary of opportunities to enhance grizzly bear populations and habitat in the Northeast.

This report, plus further investigation and analysis of the results by the Northeast region, is intended to inform the array of resource management decisions that influence the conservation and management of grizzly bear populations and habitat in the Northeast region, including but not limited to: research, inventory, and monitoring; land use and access management planning; forest and range planning and practices; major project reviews and conditions; permit authorizations; hunting and access regulations; grizzly bear recovery planning; public education; and, compliance and enforcement. As a start, it is hoped this report will inform collaborative discussions among Government decision-makers, natural resource industries, First Nations, and other community stakeholders, all of whom have a stake in ensuring natural resource decisions sustain BC's natural resources and achieve the public interest.

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

2 Grizzly Bear Overview

Grizzly bears have ecological, economic and cultural importance in BC: they are an umbrella species that reflect the overall health of the ecosystems they inhabit; hunting and bear viewing are important to the provincial economy; and, many First Nations in BC feature grizzly bears in their cultural and spiritual traditions, histories, and philosophies.

The following section provides an overview of grizzly bears in the Northeast region, including: grizzly bear habitat use and diet in the Northeast; the conservation status of Northeast populations; threats to grizzly bears in the Northeast; and, Government objectives for grizzly bears in the Northeast, and legal tools for managing and protecting the species. Appendix 1 – Grizzly Bear Backgrounder – provides a more comprehensive overview of Northeast grizzly bears.

Species Status

- **COSEWIC status:** Species of special concern.
- **BC Conservation Framework:** High priority for conservation.
- **BC State of Environment reporting:** Northeast GBPU (Muskwa, Hyland, Rocky, Taiga, Alta, Moberly and Hart) all have viable populations.

Species Information

- **General:** Highly mobile omnivores with large spatial requirements.
- **Habitat:** Grasslands and shrublands integrated with forests, subalpine meadows and forests, and alpine areas, flood plains and riparian areas.
- **Diet:** Forbs, grasses, sedges and other green vegetation in spring and early summer; berries and roots in late summer and fall; animal matter (ants, ground squirrels, ungulates) throughout the year but especially in spring and fall.
- **Travel corridors:** Mountain valley bottoms and ridgetops.

Threats to Grizzly Bears

- **Industry:** continued expansion of the energy sector, agriculture, and forestry - especially roads and other linear corridors, and dams on Peace River – have contributed to habitat loss/fragmentation and have increased human access to bear habitat.
- **Humans:** human-bear conflicts are direct threats to bear populations.
- **Climate change:** warmer temperatures, less spring snowfall, and longer growing season may positively affect spring-summer food sources; however, increases in late-season drought may negatively impact fall vegetation production; human-bear conflicts will likely increase as land uses and habitat ranges expand or shift.

Grizzly Bear Objectives and Legal Protection

- Provincial Grizzly Bear **Conservation Strategy** – “maintain in perpetuity the diversity and abundance of grizzly bears and the ecosystems upon which they depend”.
- **Forest and Range Practices Act:** (policy) grizzly bear accounts and measures; no grizzly bear WHAs established.
- **Land and resource management plans** (policy) for Northeast call for:
 - protecting critical grizzly bear habitat in WHAs
 - integrating priority grizzly bear habitats into connectivity corridors
 - maintaining forest attributes suitable for high capability grizzly bear habitat
 - minimizing new roads and deactivating/restricting access on existing roads
 - minimizing negative human-bear interactions through public education
 - maintaining economic opportunities: hunting and bear viewing
- **Wildlife Act:** hunting regulations; restriction of public access to backcountry (*Land Act*, *FRPA*, and *[All-Terrain] Motor Vehicle Act* also enable access restrictions).
- **Environmental Assessment Act:** environmental review and certification of major projects (e.g., mines, pipelines, hydropower generation) can set conditions.

3 Assessment Summary

3.1 Overview of Indicators

The current condition of grizzly bears in the Northeast region was assessed in 2015 using eleven indicators that individually and (in some cases) collectively describe the status of grizzly bear populations and habitat relative to Government’s broad objectives for grizzly bears (described above).

Table 3.1 Grizzly Bear Indicators

Indicator	Description
Population Indicators	
Population Status	The conservation status of each GBPU
Bear Density	The number of bears per 1000 km ² within each GBPU
Mortality Rate	Annual bear deaths per GBPU compared to regionally-specified mortality limits
Core Security Area	Patches of secure grizzly bear habitat (with minimal likelihood of human use) greater than 10 km ² within a LU
Front Country	Urban and rural landscapes (including rural roads up to 2 hours travel time from cities) that have relatively high human density as well as grizzly bear attractants (e.g., livestock, grain crops, fruit trees, human food, garbage)
Hunter Day Density	The number days per year that wildlife hunters occupy WMUs
Road Density	The total length of roads (and pipeline corridors, transmission line rights-of-way, and rail lines) divided by total LU area (km/km ²)
Habitat Indicators	
BEC Mid-Seral Dense Conifer	The amount of BEC Mid-Seral Dense Conifer forest within each LU, to represent areas of sub-optimal forage production
Quality Food	The capability of ecosystems to produce vegetation grizzly bears forage for (e.g., forbs, grasses, sedges, berries), measured as high and very high capability areas within the broad ecosystem inventory (BEI)
Lethal Encounter Potential and Quality Food	Combines three other indicators – front country, hunter day density, and quality food – to provide an overall sense of areas that are the highest risk for bear mortality due to human (especially hunter) presence in key bear habitat
Quality habitat protected	The amount of high capability grizzly bear habitat within a LU that is protected in conservation areas and wildlife habitat areas

See Appendix 2 for a conceptual model that illustrates how the indicators work together to influence the functions and processes that support grizzly bear populations and habitat.

In the next section, the approach to assessing each indicator is explained in more detail to help reviewers of this report interpret the results. For more insights into the grizzly bear assessment methodology and data sources, refer to the [Interim Assessment Protocol for Grizzly Bear in British Columbia](#) (December 2017).

3.2 Summary for Resource Managers

The following section provides a high-level summary of the current condition of grizzly bear populations and habitat in the Northeast region, based on the results for 11 indicators. For each indicator, an assessment of the utility of the results (level of **precision** and **relevance** for informing management responses) is included. As well, the region's perspective on potential next steps to strengthen the information base needed to support management responses is discussed below this section.

Population Indicators:

Population Status

- All seven grizzly bear population units (GBPUs) in the Northeast region have viable bear populations, as per State of the Environment reporting (2012).
- Due to very low (less than 100) populations in Taiga and Moberly GBPUs, there has been a moratorium on hunting grizzly bears in these GBPUs since 2001.
- **Regional assessment:** *this indicator has **low precision** and **high relevance**.*

Bear Density

- Grizzly bear densities (bears per 1000 km²) for GBPUs in the Northeast region are uncertain at this time due to the lack of current field inventories to validate the regression model used to estimate bear densities.
- Regional specialists believe bear density estimates based on the regression model may be conservative as they are based on vegetation productivity, which is limited in the region by low annual rainfall. Rather, specialists believe bear densities may be driven more by availability of terrestrial protein, which the model does not consider. The region's theory is supported by local research and stakeholder observations.
- Field-based bear density inventories in representative ecosystems are needed to validate this indicator and to support management responses to this report.
- **Regional assessment:** *this indicator has **low precision** and **high relevance**.*

Mortality Rate

- Annual reported grizzly bear mortality exceeded regionally-specified limits in wildlife management units (WMUs) within all GBPUs except for Muskwa and Hyland GBPUs. Excessive mortality was deemed a high risk for Alta and Hart GBPUs and a very high risk for the Rocky GBPU.
- Reasons for excessive mortality are not included in the results, but may include hunting, human-bear conflicts, poaching, road kills and rail kills. Since 2000, hunting has accounted for 83% of reported human-caused grizzly bear deaths in the region.
- In December 2017, the BC Government announced a provincial ban on grizzly bear hunting (other than hunting by First Nations).
- **Regional assessment:** *this indicator has **high precision** and **low relevance**.*

Core Security

- Core security areas (viable grizzly bear habitat buffered from human activity) are best represented in the northwest portion of the region, including Muskwa and Hyland GBPUs and the northwest portion of the Rocky GBPU.
- Rocky, Taiga, Alta, Moberly, and Hart GBPUs all contain significant deficits of core security given their proximity to urban and agricultural areas, and their high concentrations of industrial roads, corridors and infrastructure.
- **Regional assessment:** *this indicator has moderate precision and high relevance.*

Front Country

- Front country areas (interface between humans and bears in urban/rural areas that contain grizzly bear attractants, such as livestock, grains, crops, fruit trees) generally correlate with areas of core security deficit (as noted above).
- There are some exceptions to this rule: some remote areas in Muskwa, Hyland and Rocky GBPUs have front country *and* core security; these areas tend to be protected or roadless but are accessible for hunting/recreation by river (many Northeast rivers are major recreation corridors).
- **Regional assessment:** *this indicator has moderate precision and low relevance.*

Hunter Day Density

- Hunter day density (the number of days per year that (all) wildlife hunters occupy WMUs) is low in Muskwa and Hyland GBPUs and most parts of Rocky GBPU.
- Hunter day density is moderate to high in Taiga, Alta, Rocky, Moberly and Hart GBPUs (near urban areas and mountainous areas with high ungulate populations).
- **Regional assessment:** *this indicator has high precision and high relevance.*

Road Density

- Risks to grizzly bear populations and habitat correlate more with road density than any other indicator because roads facilitate human-bear interactions and they are avoided by bears, leading to habitat loss and fragmentation, population isolation/decline.
- Roadless or low road density areas are located in Muskwa and Hyland GBPUs, in the north and western flank of the Rocky GBPU, and in the southwest of the Hart GBPU.
- Areas of high road density include all of the Taiga, Alta, and Moberly GBPUs, the eastern flank of the Rocky GBPU, and most of the Hart GBPU.
- **Regional assessment:** *this indicator has moderate precision and high relevance.*

Habitat Indicators:

BEC Mid-Seral Dense Conifer

- Mid-seral dense conifer forests, which are the antithesis of desirable habitat for grizzly bears given their sub-optimal forage production, are rare in the Northeast, which features forest succession to Aspen, low natural conifer densities, and little impacts to forage from wildfire.
- Landscape units flagged for management attention because they contain more than 30% mid-seral dense conifer (and therefore sub-optimal forage supply) are limited to relatively small areas of the Moberly and Hart GBPUs.
- **Regional assessment:** *this indicator has no precision and low relevance.*

Quality Food

- Quality food, a measure of vegetation productivity (total weighted area of broad ecosystem inventory [BEI]), is limited in the Northeast by low annual rainfall.
- Areas of highly productive vegetation are limited to the Sub-Boreal Interior (within Rocky and Moberly GBPUs) and Southern Interior Mountains (within the Hart GBPU).
- As noted under bear density, a more appropriate indicator of habitat capability for grizzly bears may be the availability of terrestrial protein (primarily ungulates).
- **Regional assessment:** *this indicator has **no precision and moderate relevance**.*

Lethal Encounter Potential and Quality Food

- Areas of highest risk of human-caused bear mortality (lethal encounters) reflect a combination of high-risk front country areas, high-risk hunter-day density areas, and high-risk quality food areas.
- In the Northeast, areas flagged as high risk for lethal encounters are located in the southern portion of the Rocky GBPU and most of the Hart GBPU.
- These results may have limited validity given that areas of quality food (measured by vegetation productivity) are more likely a measure of availability of terrestrial protein.
- **Regional assessment:** *this indicator has **no precision and no relevance**.*

Quality Habitat Protected

- Areas of protected high-capability grizzly bear habitat in the Northeast are limited to Muskwa, Rocky and Hart (southernmost tip only) GBPUs. In contrast, all other GBPUs have large areas with minimal to no conservation of grizzly bear habitat (protected = parks, wildlife management areas, OGMAs, WHAs, etc.).
- There are no grizzly bear WHAs in the Northeast, but recent TEM mapping in the Moberly GBPU will inform potential future grizzly bear WHAs in that GBPU.
- Of note, this indicator bases high-capability habitat on vegetation productivity, not availability of terrestrial protein.
- **Regional assessment:** *this indicator has **high precision and high relevance**.*

Regional Commentary on Results

Based on their assessment of the above 11 indicators, regional specialists suggest resource managers focus attention on the highest utility indicators: core security area, hunter day density, road density, and quality habitat protected.

In addition to the indicators assessed in this report, other indicators worth exploring in the Northeast region include: agricultural land density, amount of high elevation habitat, presence of black bears in grizzly bear habitat (competition), and threats associated with backcountry recreation.

Future environmental and industrial trends will be important to consider when determining next steps for managing grizzly bear populations and habitat in the Northeast. For example:

- Past logging will create more closed-canopy forests in future, which are not suitable grizzly bear habitat;
- Continued industrial and urban expansion would further reduce viable grizzly bear habitat, especially in the Moberly and Hart GBPUs; and,

- Effects of climate change on grizzly bears are uncertain, but some possible effects may increase the risk for human bear conflict.

Further research on grizzly bear diet, and habitat use and selection, is needed to validate indicator results and to determine appropriate next steps to manage and conserve grizzly bear populations and habitat in the Northeast.

Finally, recent Government decisions to develop a provincial grizzly bear management plan, to ban hunting of grizzly bears across the province, and to modernize land use plans will be instrumental in informing the Northeast region's actions to address this report. For example, strategic landscape-level planning across the region will be the most valuable way to engage agencies and stakeholders in assessing options for protecting and/or restricting human access to areas of high capability grizzly bear habitat.

4 Assessment Results for each Indicator

Interpretation of Indicator Results

In this section, the assessment results for each indicator are presented in the form of thumbnail maps that provide a high-level overview of and key to interpreting the results. Each map gives a condensed “general impression” of the assessment results.

As a companion to the thumbnail maps for each indicator, a brief description of the indicator and a key to interpreting the results is provided, followed by regional commentary that describes and elaborates upon the maps with a discussion of: what the results mean; relevant contributing or causal factors; supporting numerical data where it is useful; limitations, if any, in the utility of the results; and, any other relevant local information (such as complementary research, inventory, monitoring, or cumulative effects analyses) that would help clarify the current condition of grizzly bears relative to the indicator.

Important Note

It is important to emphasize that management units (primarily landscape units) flagged as higher risk to grizzly bears do not necessarily equate to areas of actual adverse impacts to grizzly bear populations or habitat. Higher risk and flagged LUs are intended to point regional specialists and decision-makers to areas that may warrant further investigation and analysis prior to determining whether or what management (mitigation) response is warranted.

Although data for the indicators was gathered at multiple scales - primarily the grizzly bear population unit (GBPU) and wildlife management unit (WMU)² scales – all of the indicators except population status (which reports at the GBPU scale) extrapolate and report results at the much smaller landscape unit (LU)³ scale to inform resource management planning and decision-making at strategic, tactical and operational scales. With that said, the regional commentary for each indicator typically discusses results at the GBPU level.

For key indicators (core security area, front country, road density, quality habitat protected), supplementary tables of source data are included to assist planners and decision-makers in understanding and interpreting the indicator results.

² For bear density and mortality indicators, data was also gathered by Limited Entry Hunt (LEH) zone within WMUs.

³ Landscape units more closely approximate the size of one to several adult female home ranges.

4.1 Population Status

Indicator Description:	This indicator reports the conservation status of a GBPU – viable, threatened or extirpated – as determined through State of the Environment reporting. ⁴ Population status is based on estimated population size and the difference between ideal and actual habitat carrying capacity [excluding human influence]. ⁵
Interpretation Key:	<ul style="list-style-type: none"> • Each GBPU is identified as viable, threatened or extirpated. • Threatened GBPUs are flagged for management attention.
Assessment Results	<ul style="list-style-type: none"> • See Figure 4.1—opposing page

Regional Commentary:

There are seven GBPUs in the Northeast. From north to south, they are Muskwa, Hyland, Rocky, Taiga, Alta, Moberly, and Hart. Based on 2012 estimates, all GBPUs in the Northeast region have viable grizzly bear populations (see Table 4.1 below).

Grizzly bears are considered extirpated⁶ in the lower Peace River basin (lowlands), an area of dense agriculture and the communities of Fort St John and Dawson Creek. 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). Anecdotal sightings of bears in this area support this theory.

Table 4.1. Population Unit Summary Table

GBPU*	Status	Estimated Population	Bear Density (bears/1000km ²)	Total GBPU Area (km ²)
Muskwa	Viable	840	24	35,191**
Hyland	Viable	231	14	17,221
Rocky	Viable	538	14	37,659
Taiga	Viable	94	2	49,497
Alta	Viable	132	10	13,180
Moberly	Viable	71	10	7,522**
Hart	Viable	244	13	19,502**

Notes: *Hunting was not permitted in bolded units as these units have low grizzly bear populations and densities.
**Very small portions of Muskwa and Hart GBPUs are located within Skeena and Omineca regions (respectively); about one-third of the Moberly GBPU is located within the Omineca region.

⁴ See [Grizzly bear population status in BC](#).

⁵ Note that the provincial government is in the process of updating the status of grizzly bear populations according to the **NatureServe** population ranking methodology, which considers: existing and future threats (habitat loss, alteration and alienation; collisions and displacement due to roads; hunting mortality; and, food availability); population size and trend over 3 generations; genetic isolation resulting from population fragmentation; and, the anticipated effects of climate change. This will lead to more precise classification of GBPUs in future.

⁶ Extirpated means there is no evidence of resident reproductive females.

Regional assessment: *this indicator has low precision and high relevance.*

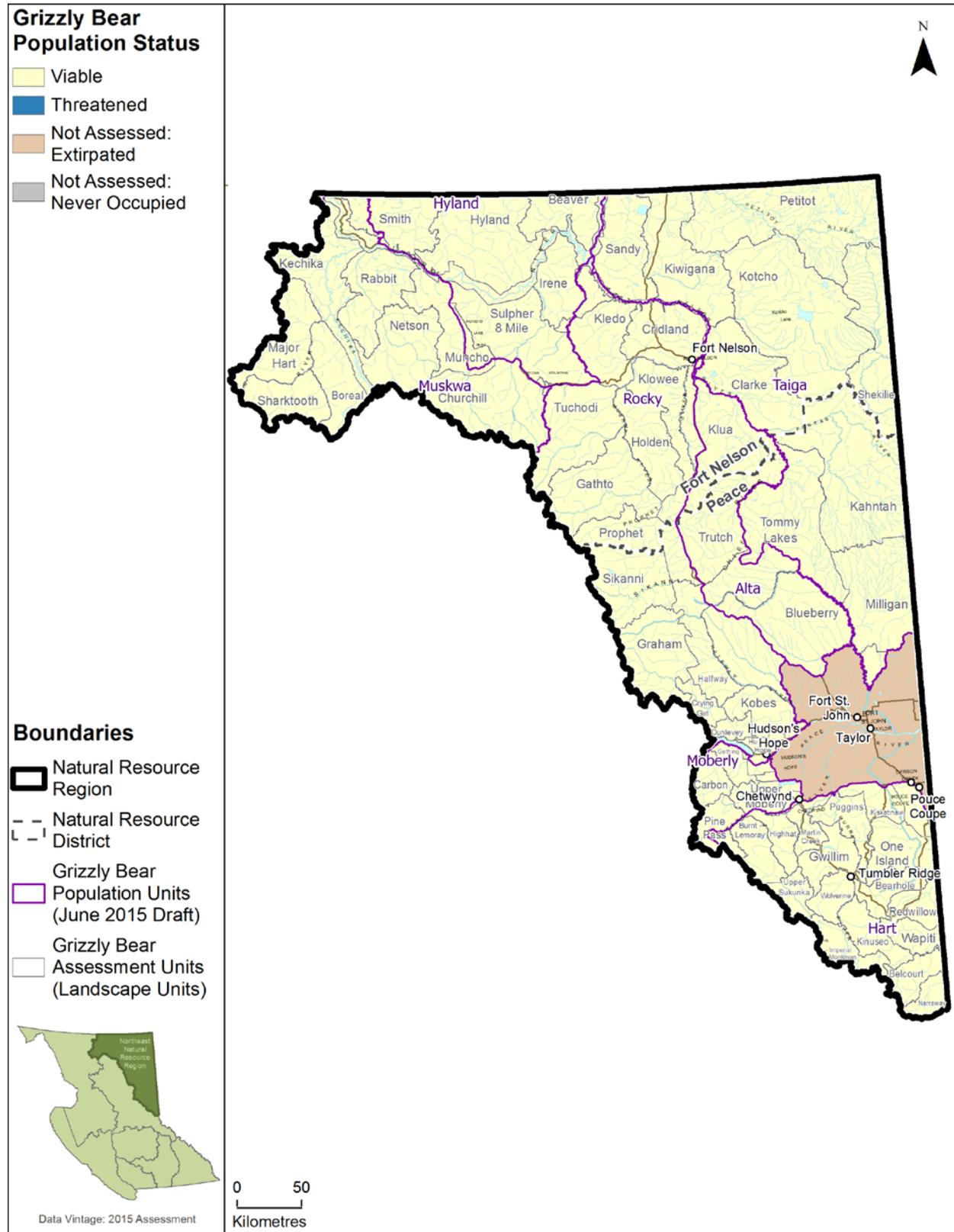


Figure 4.1 Grizzly Bear Population Status – Northeast region

4.2 Bear Density

Indicator Description:	This indicator reports the number of bears per 1000 km ² , based on measured populations or population estimates (based on a regression model). ⁷ Bear densities are reported by GBPU and extrapolated to landscape unit. Model-generated bear density estimates may be validated or revised based on local knowledge and field-based DNA studies.
Interpretation Key:	<ul style="list-style-type: none"> • Bear densities greater than 10 bears per 1000 km² are low risk. • Bear densities less than 10 bears per 1000 km² are higher risk and are flagged for management action.
Assessment Results:	<ul style="list-style-type: none"> • See Figure 4.2—opposing page

Regional Commentary:

Table 4.1 includes estimated bear densities for each GBPU. Areas of low bear density that are flagged for management attention include: the Taiga GBPU; the northern portion of the Hyland GBPU (Hyland and Beaver LUs); southern and northern LUs within the Rocky GBPU; the Tommy Lakes LU within the Alta GBPU; and, the northern portion of the Hart GBPU (seven LUs around and north of Tumbler Ridge). Note that Taiga and Hyland GBPUs have *naturally low* bear densities.

The regression model used to estimate bear density in interior ecosystems relies on several indicators, including precipitation, which is the main indicator of plant productivity (the capability of ecosystems to produce vegetation grizzly bears rely on). In the Northeast region, annual precipitation is low. Therefore, grizzly bear density estimates for the region, based on the regression model, are low. Furthermore, there are no current grizzly bear inventories in the region to validate bear density estimates based on the model. In fact, the only targeted inventory of grizzly bears in the Northeast ([Poole, 2001](#)) covers only 8,527 km² (less than 5% of the region) and is now dated.

In the Northeast, there is some evidence to suggest grizzly bear diet is more reliant on terrestrial protein sources (primarily ungulates).⁸ For example, local knowledge suggests that bear densities may be higher than estimated in the more remote LUs within the Muskwa GBPU, in the northern portion of the Hyland GBPU (the Hyland LU), and in the mountains around Tumbler Ridge within the Hart GBPU. Assuming that terrestrial protein is an indicator of bear density in the Northeast, bear density estimates based solely on the regression model may be conservative.

Due to the uncertainty associated with grizzly bear population and density estimates for the Northeast, field-based population inventories would be necessary in representative ecosystems across the region, to provide validated estimates that support appropriate management (mitigation) responses to the

⁷ See Mowat et al, [Predicting Grizzly Bear Density in Western North America](#), 2013.

⁸ Research in the Besa-Prophet watershed (Northern Rocky Mountains) ([Milakovic, 2011 and 2012](#)) found that a high proportion of the grizzly bear's diet (51% for males, 32% for females) comprises ungulate meat.

indicator results in this report. are recommended in representative ecosystems across the region as a high priority (See Section 6.3, Potential Next Steps).

Regional assessment: *this indicator has **low precision** and **high relevance**.*

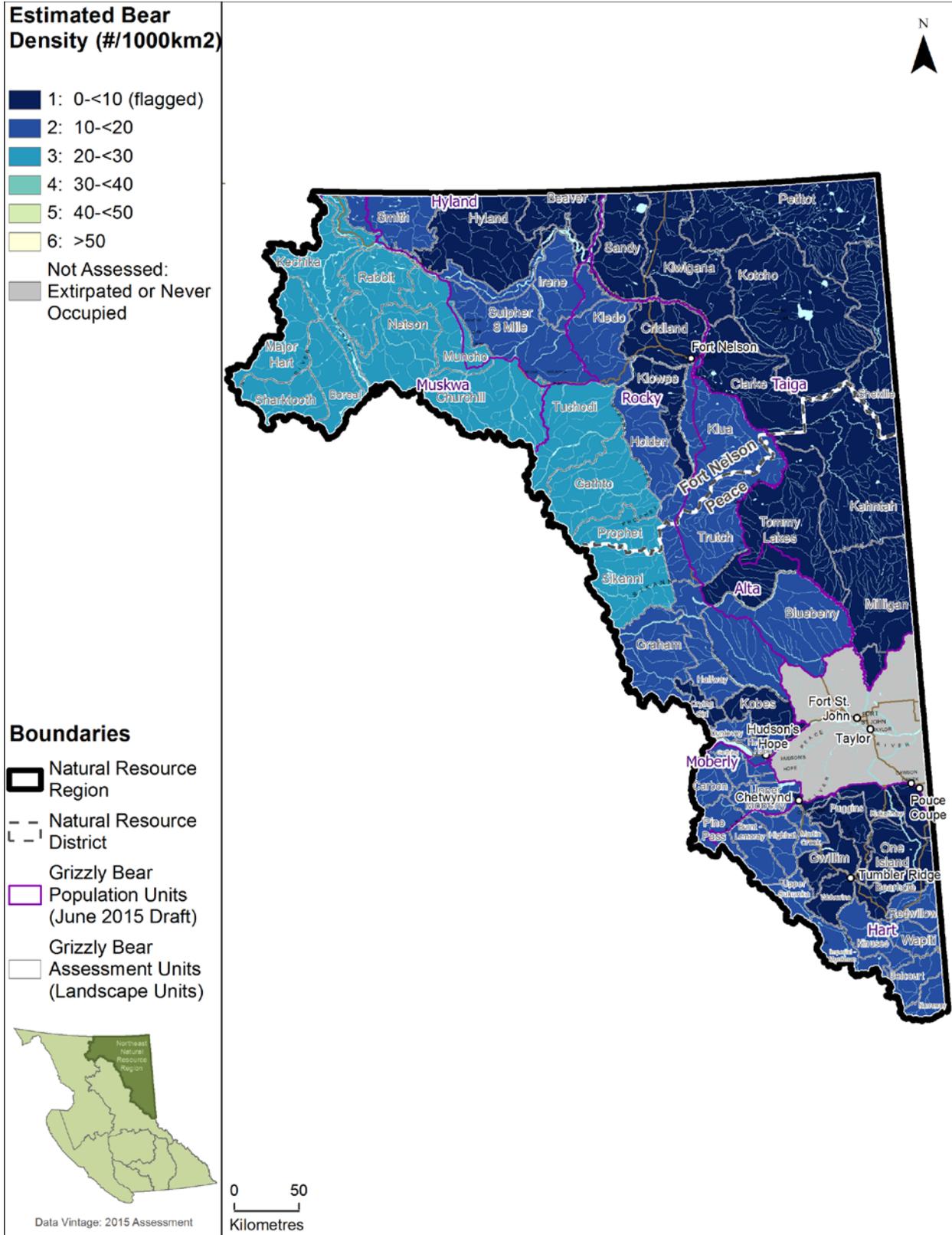


Figure 4.2 Bear Density- Northeast Region

4.3 Mortality Rate

Indicator Description:	This indicator reports annual human-caused bear deaths per GBPU (as reported in the Compulsory Inspection Database [CID]) compared to regionally-specified mortality limits. ⁹ Mortality limits may vary from region to region but are capped at 6% of a grizzly bear population within a WMU ¹⁰ . Humans are the main cause of grizzly bear mortality, with most bear deaths resulting from hunting. Other human causes of bear mortality include human-bear conflicts, poaching, and collisions with vehicles and trains.
Interpretation Key:	<ul style="list-style-type: none"> • Results for each WMU are extrapolated to LU. • A LU is flagged for management attention if the annual mortality rate exceeds the regionally-specified limit.
Assessment Results:	<ul style="list-style-type: none"> • See Figure 4.3—opposing page

Regional Commentary:

Hunting of grizzly bears is not permitted in the Taiga and Moberly GBPUs because these units have relatively low estimated densities of grizzly bears (less than 10 bears per 1000 square kilometres).

Indicator results suggest the annual mortality exceeded regional limits in WMUs within all GBPUs except for Muskwa and Hyland, with excessive mortality a high risk for Alta and Hart GBPUs, and a very high risk for the Rocky GBPU. However, the indicator results do not specify reasons for excessive mortality.

In the CID, reported mortality losses fall into six categories: hunting, animal control (to address human-bear conflicts), illegal hunting, pick-ups (grizzly bears found dead, with cause of death unspecified), road kills, and rail kills.

Since 2000, CID-reported grizzly bear deaths for Region 7 (which includes Peace and Omineca Fish and Wildlife sub-regions) have totalled 1237, with 1032 (83%) the result of hunting,¹¹ 165 (13%) the result of animal control, 28 (2%) the result of illegal hunting, seven unspecified (pick-ups), three the result of rail kills, and two the result of road kills (these last three reasons totalling less than 1% of reported grizzly bear deaths).

Regional assessment: *this indicator has **high precision and low relevance**.*

Important Note

In December 2017, the BC Government announced a provincial ban on grizzly bear hunting (other than hunting by First Nations for food, social and ceremonial purposes) to conserve grizzly bear populations that are threatened by habitat loss and fragmentation as well as by direct human-caused bear mortality. This decision will affect future management of grizzly bear mortality by the region, especially given that hunting has traditionally accounted for the vast majority of mortality losses in the Northeast.

⁹ Mortality limits for each Fish & Wildlife region are established using the BC Government's [Grizzly Bear Harvest Management Procedure](#) (2004). Mortality limits include known mortalities plus an estimate of unknown human-caused mortalities.

¹⁰ Mortality limits are established by limited-entry hunt (LEH) zones (within WMUs) for resident hunters and by quota for guided non-resident hunters.

¹¹ In the Peace sub-region (Region 7B), an average of 59 grizzly bears are harvested each year by licensed hunters.

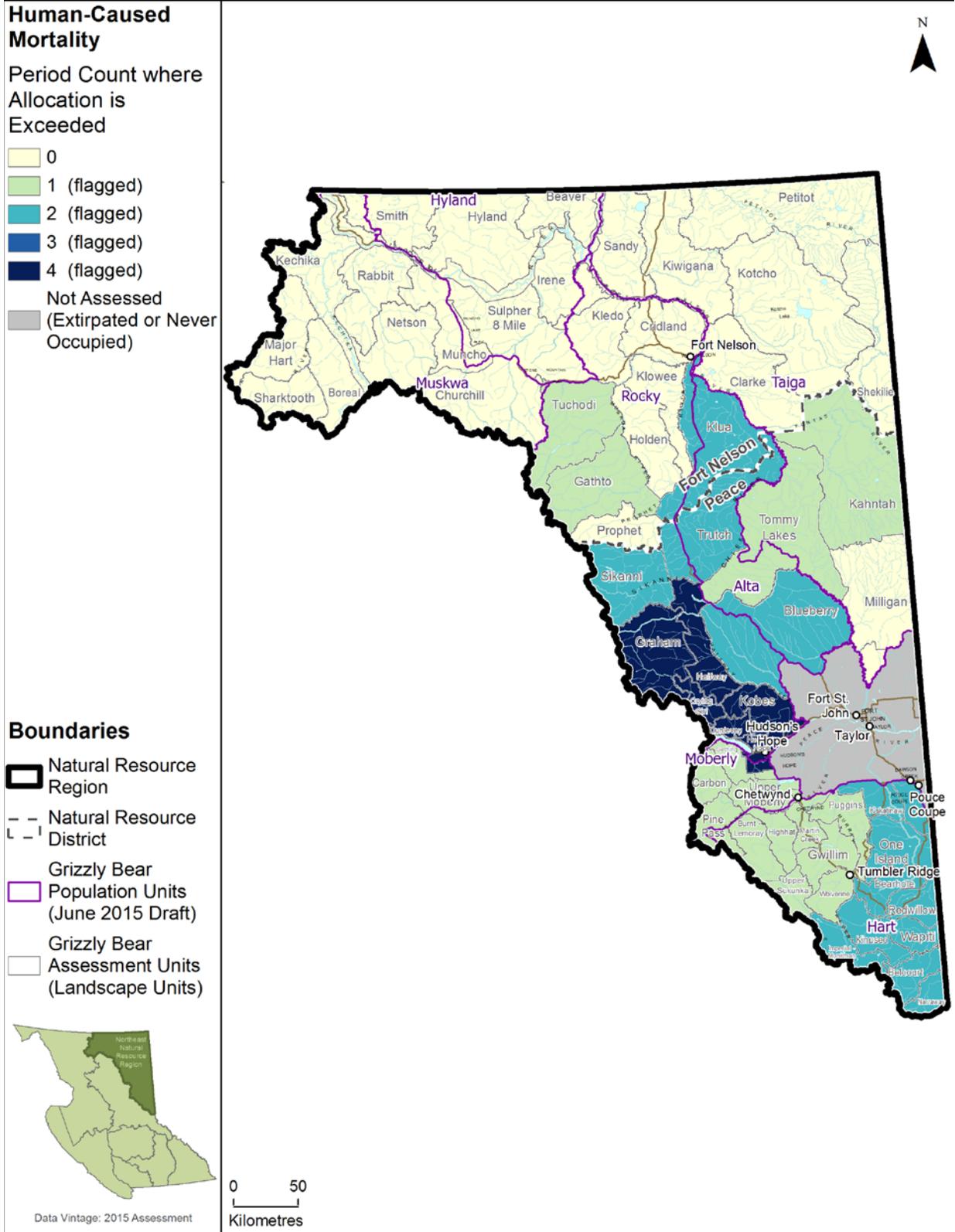


Figure 4.3 Mortality Rate- Northeast Region

4.4 Core Security Areas

Indicator Description:	This indicator reports core security areas, which are patches of capable secure core greater than 10 km ² within a LU. Core security areas are areas of adequate grizzly bear habitat with minimal likelihood of human use. These areas are large enough to accommodate a female grizzly bear’s daily foraging requirements and to buffer grizzly bears from human infrastructure and activity (e.g., roads, settlement areas, recreation areas, industrial areas) ¹² . To adequately buffer grizzly bears from humans, these areas must be 500 metres or more from human infrastructure and activity.
Interpretation Key:	<ul style="list-style-type: none"> • LUs with at least 60% of the area in core security areas pose a low 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.
Assessment Results:	<ul style="list-style-type: none"> • See Figure 4.4—opposing page

Regional Commentary:

Core security areas for grizzly bears in the Northeast are best represented in the northwest portion of the region, including most of the Muskwa and Hyland GBPUs, and the northwest portion of the Rocky GBPU.

Given that core security areas must be 500 metres or farther from human infrastructure and activity, it is not surprising that the Rocky, Taiga, Alta, Moberly, and Hart GBPUs all contain significant deficits of core security. All of these GBPUs surround urban and agriculture areas, and contain high concentrations of industrial roads, corridors, and infrastructure associated with oil and gas exploration, pipelines, hydro power generation, utilities, mines, and forestry. As noted in the Grizzly Bear Overview (and Appendix 1), industrial roads (and permanent corridors) are the primary means for guide-outfitters, hunters, trappers, and recreation enthusiasts to access the backcountry.

The ratio of core security area (viable habitat) to non-core security area (human-occupied areas, including roads) within each GBPU is described in Appendix 3 - Table 1.

Regional assessment: *this indicator has moderate precision and high relevance*

¹²Note that seismic corridors are excluded from ‘core security areas’ as there is wide variability in the permanence of these features and they have variable risks/benefits for grizzly bears.

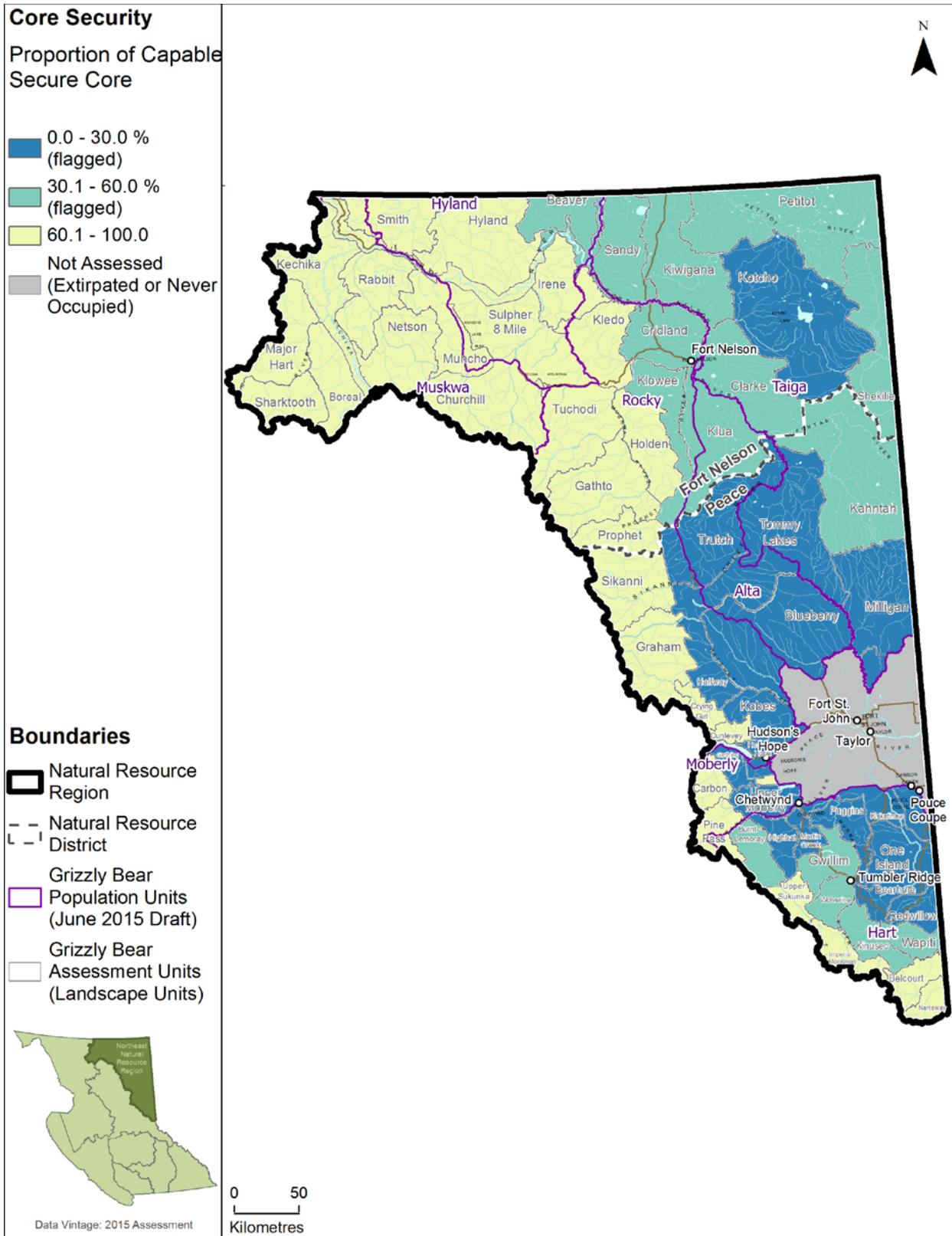


Figure 4.4 Core Security Area—Northeast Region

4.5 Front Country

Indicator Description:	This indicator reports the proportion of each LU that is in front country. Front country includes both urban and rural landscapes that have relatively high human density <i>as well as</i> grizzly bear attractants such as livestock, livestock carcasses, feed, grain crops, fruit trees, and human food and garbage. This indicator includes areas of human settlement (including communities and agricultural areas) as well as high use rural roads (roads up to 2 hours travel time from cities).
Interpretation Key:	<ul style="list-style-type: none"> • 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 higher risk to grizzly bears, and are flagged for management attention.
Assessment Results:	<ul style="list-style-type: none"> • See Figure 4.5—opposing page

Regional Commentary:

Front country – urban and rural landscapes, including rural roads up to 2 hours travel time from cities – 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 human-bear encounters (and conflicts) and consequent risk of bear mortality in the front country is high.

With some exceptions noted in the Muskwa, Hyland, and Rocky (northeast portion) GBPUs, areas of front country in the Northeast region generally correlate with areas of core security deficit.

Areas of the Muskwa, Hyland and Rocky GBPUs that have front country but not a corresponding deficit in core security tend to be located in protected or managed areas (such as the Muskwa-Kechika Management Area) and/or are roadless or have minimal roads. An example would be the Muskwa River, which is located in a remote area but is used by hunters to access hunting areas (via jet boat). As noted in Appendix 1 – Grizzly Bear Backgrounder – many of the Northeast’s river systems (and Williston Lake) are major recreation corridors.

The proportion of each GBPU in front country versus back country is described in Appendix 3 – Table 2.

Regional assessment: *this indicator has moderate precision and low relevance.*

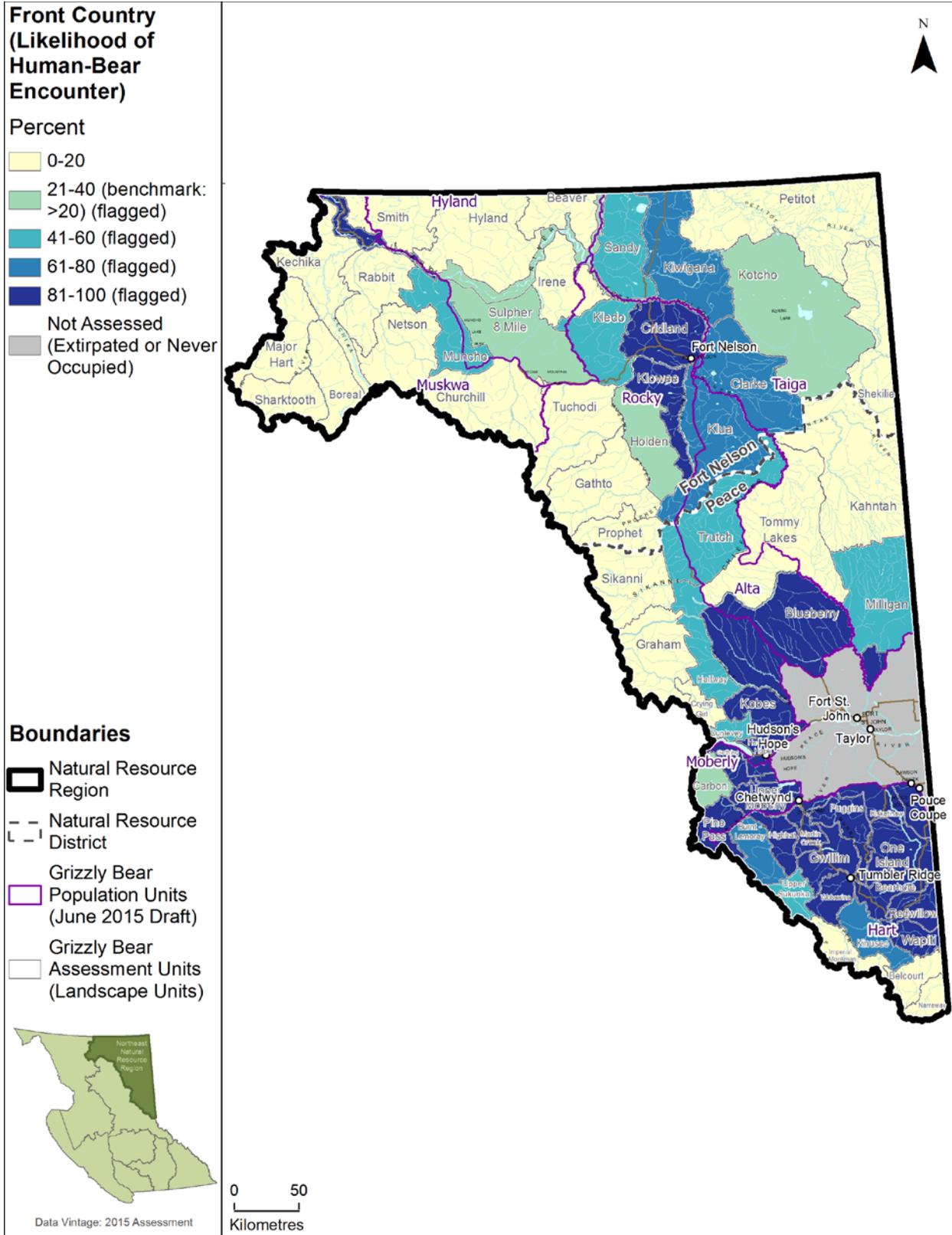


Figure 4.5 Front Country—Northeast region

4.6 Hunter Day Density

Indicator Description:	This indicator reports average annual hunter day density, which is the number of days per year (calculated over a 10-year period) that wildlife hunters occupy WMUs. The number of hunter days per km ² is reported by LU. Note that this indicator reflects activity of all hunters, not just grizzly bear hunters.
Interpretation Key:	<ul style="list-style-type: none"> • Average annual hunter days of 0 – 0.601977/km² are low risk to grizzly bears. • Average annual hunter days of 0.601977 – 1.508812/km² are moderate risk to grizzly bears. • Average annual hunter days greater than 1.508812/km² are high risk to grizzly bears, and are flagged for management attention.
Assessment Results:	<ul style="list-style-type: none"> • See Figure 4.6—opposing page

Regional Commentary:

Hunter day density is low in the Muskwa and Hyland GBPUs, and in most parts of the Rocky GBPU. Hunter day density is moderate to high in the Taiga, Alta, Rocky, Moberly and Hart GBPUs. High hunter day density areas that are flagged for management attention are close to urban areas (Fort St. John and Dawson Creek), in the Northern Rocky Mountains of the Rocky GBPU, and in the Southern Interior Mountains of the Hart GBPU. These areas are known for high ungulate populations.

Regional assessment: *this indicator has **high precision** and **high relevance**.*

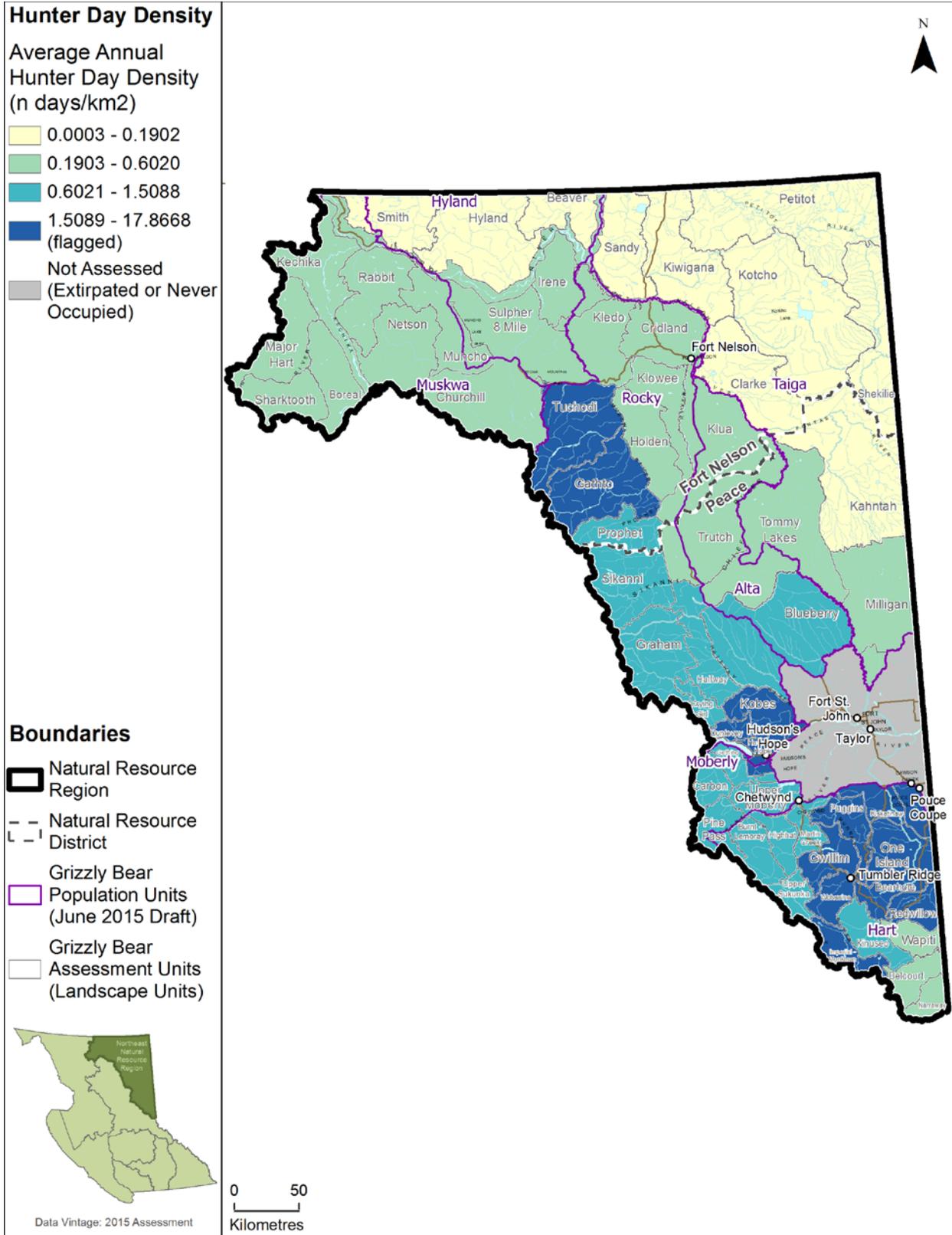


Figure 4.6 Hunter Day Density—Northeast Region

4.7 Road Density

Indicator	This indicator reports total length of open roads ¹³ (as well as pipeline corridors, transmission line rights-of-way, and rail lines) divided by total LU area (km/km ²).
Description:	Most grizzly bear deaths occur within 500 metres of a road or other corridor, and are the result of human-bear conflicts, poaching, or collisions with vehicles and trains. As well, as road density increases, habitat avoidance increases, leading to habitat loss and fragmentation, and ultimately to isolation and decline of grizzly bear populations.
Interpretation	<ul style="list-style-type: none"> • Road densities of 0 - 0.3 km/km² are low risk to grizzly bears.
Key:	<ul style="list-style-type: none"> • Road densities of 0.31 - 0.6 km/km² are moderate risk to grizzly bears. • Road densities of 0.61 - 0.75 km/km² are high risk to grizzly bears. • Road densities greater than 0.75 km/km² are very high risk to grizzly bears.¹⁴
Assessment Results:	<ul style="list-style-type: none"> • See Figure 4.7—opposing page

Regional Commentary:

Risks to grizzly bear populations and habitat correlate more with road density than any other indicator, for two key reasons: most grizzly bear mortality (at the hands of humans) is within 500 metres of a road, and densely-roaded areas are avoided by grizzly bears, which (as road density increases) leads to bear habitat loss and fragmentation, population isolation, and population decline over time.

In the Northeast region, areas with no roads or very low road density are located in the Muskwa and Hyland GBPUs, in the north and western flank of the Rocky GBPU, and in the southwest portion of the Hart GBPU. Areas flagged for management attention because they contain high road densities include all of the Taiga, Alta, and Moberly GBPUs, the eastern flank of the Rocky GBPU, and most of the Hart GBPU.

This indicator did not include seismic lines. Seismic lines that remain open past their industrial shelf-life provide another avenue for people to access the backcountry.¹⁵ As well, data sources for road density in the Northeast do not specify which industrial roads are accessible in winter only. The likelihood of human-bear interactions associated with winter-access-only roads is nil given that bears are not active when these roads are being used.

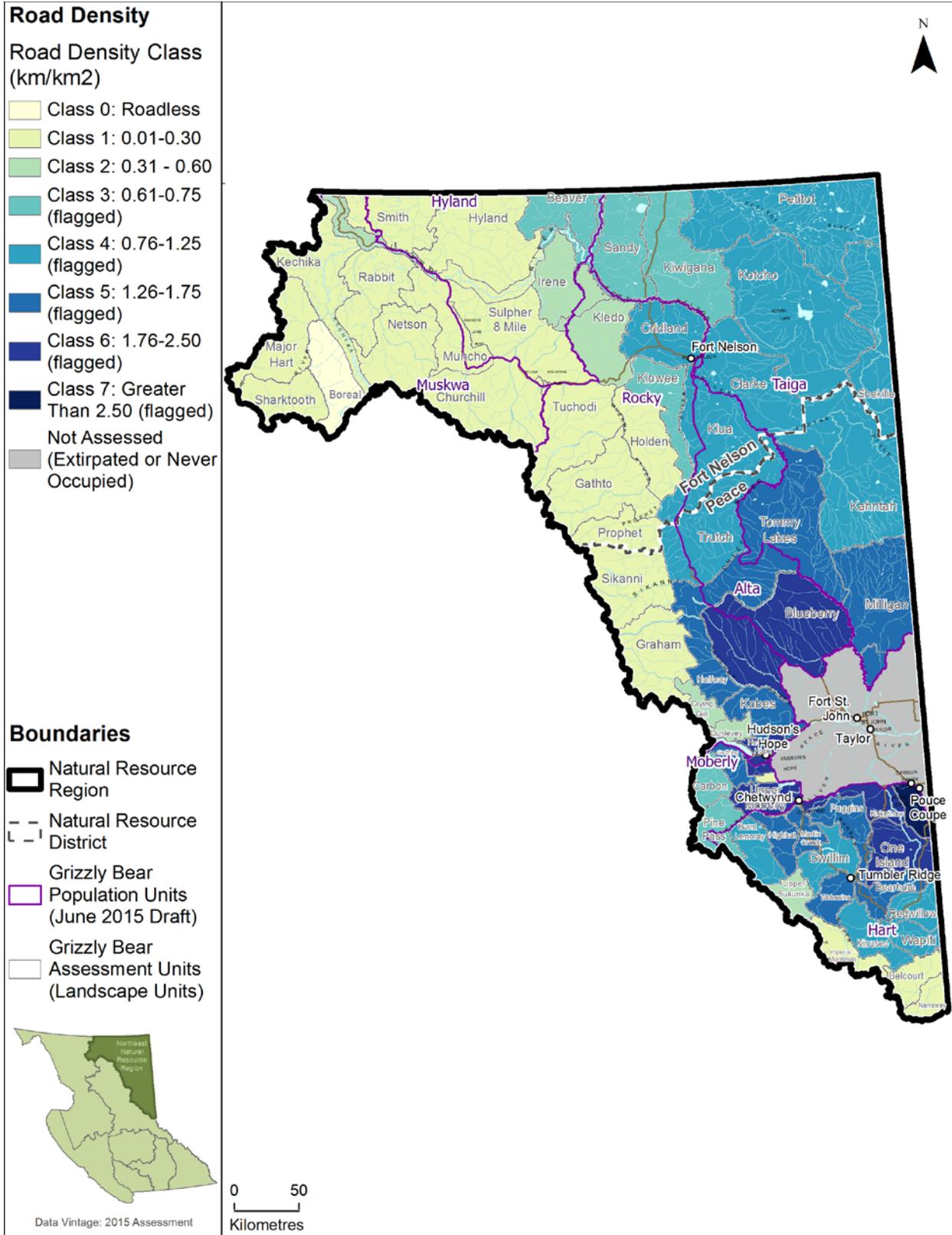
Areas of road density within each GBPU are described in Appendix 3 – Table 3.

Regional assessment: *this indicator has moderate precision and high relevance.*

¹³ Note that this indicator does not include roads that are permanently deactivated or closed to access.

¹⁴ These road density thresholds are based on several research studies, most notably Boulanger and Stenhouse, 2014.

¹⁵ Although many seismic lines are deactivated, closed to access, or become brushed over with time, some (especially older cat-cut lines), continue to provide hunters, trappers and backcountry enthusiasts with access to grizzly bear habitat.



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Figure 4.7 Road Density –Northeast Region

4.8 BEC Mid-Seral Dense Conifer

Indicator Description:	This indicator reports the amount of mid-seral ¹⁶ dense conifer forest (by BEC zone) within each LU to represent areas of grizzly bear habitat that are <i>sub-optimal</i> for forage production. Grizzly bears prefer open canopy forests as these forests support greater berry production, 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:	<ul style="list-style-type: none"> • LUs with less than 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.
Assessment Results:	<ul style="list-style-type: none"> • See Figure 4.8—opposing page

Regional Commentary:

In the Northeast, 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.

Mid-seral conifer forests are rare in the Northeast because the region's ecosystems are unique in BC (forest succession to Aspen), have low natural conifer densities, and have little landscape-wide impacts to forage production from wildfire.

Areas of the region that are flagged for management attention because the landscape units contain more than 30% mid-seral dense conifer (and therefore contain sub-optimal forage supply for grizzly bears) are limited to the Moberly and Hart GBPUs.

Regional assessment: *this indicator has no precision and low relevance.*

¹⁶ Mid-seral dense conifer forests are typically 40 to 100 years old depending on the ecosystem (Biodiversity Guidebook, 1995).

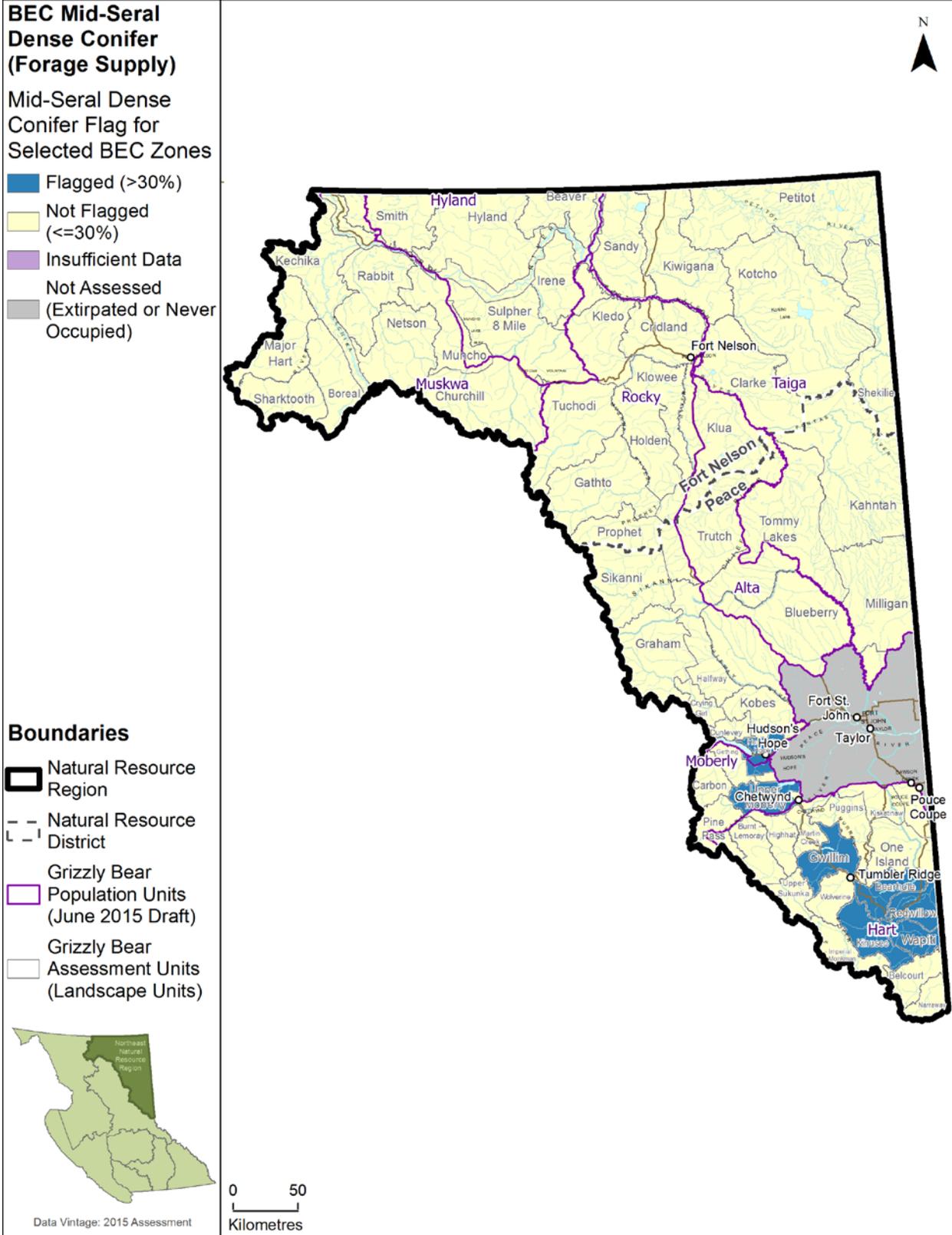


Figure 4.8 Mid-Seral Dense Conifer –Northeast Region

4.9 Quality Food

- Indicator Description:** This indicator reports the capability of ecosystems to produce grizzly bear forage species (i.e., forbs, grasses, sedges, other green vegetation, and berries), which is summarized as total weighted area of the broad ecosystem inventory (BEI) in high and very high capability classes.¹⁷ Although grizzly bears are omnivores with a varied diet (that also includes ungulates, small mammals, carrion, insects and roots), data on forage supply in the Northeast is limited to vegetation productivity.
- Interpretation Key:**
- Quality food is considered present if more than 50% of the LU is classified as high or very high capability BEI.
- Assessment Results:**
- See Figure 4.9—opposing page

Regional Commentary:

The productivity of vegetation in most Northeast ecosystems – the Boreal and Taiga Plains and the Northern Boreal Mountains – is limited by low annual rainfall. Areas with highly productive vegetation are limited to the Sub-Boreal Interior (within the Rocky and Moberly GBPUs) and the Southern Interior Mountains (within the Hart GBPU).

As noted elsewhere in this report, a more appropriate indicator of habitat capability for grizzly bears in the Northeast may be the presence of terrestrial protein, primarily ungulates but also ants, ground squirrels, carrion, and other small mammals. As suggested with the previous indicator (mid-seral conifer), further research on grizzly bear diet and habitat use and selection across the Northeast region is necessary to inform and focus Government efforts to sustain grizzly bear populations.

Regional assessment: *this indicator has **no precision and moderate relevance.***

¹⁷ “Capability” refers to potential productivity with optimal vegetation for a species (unlike “suitability,” which refers to existing productivity with present vegetation).

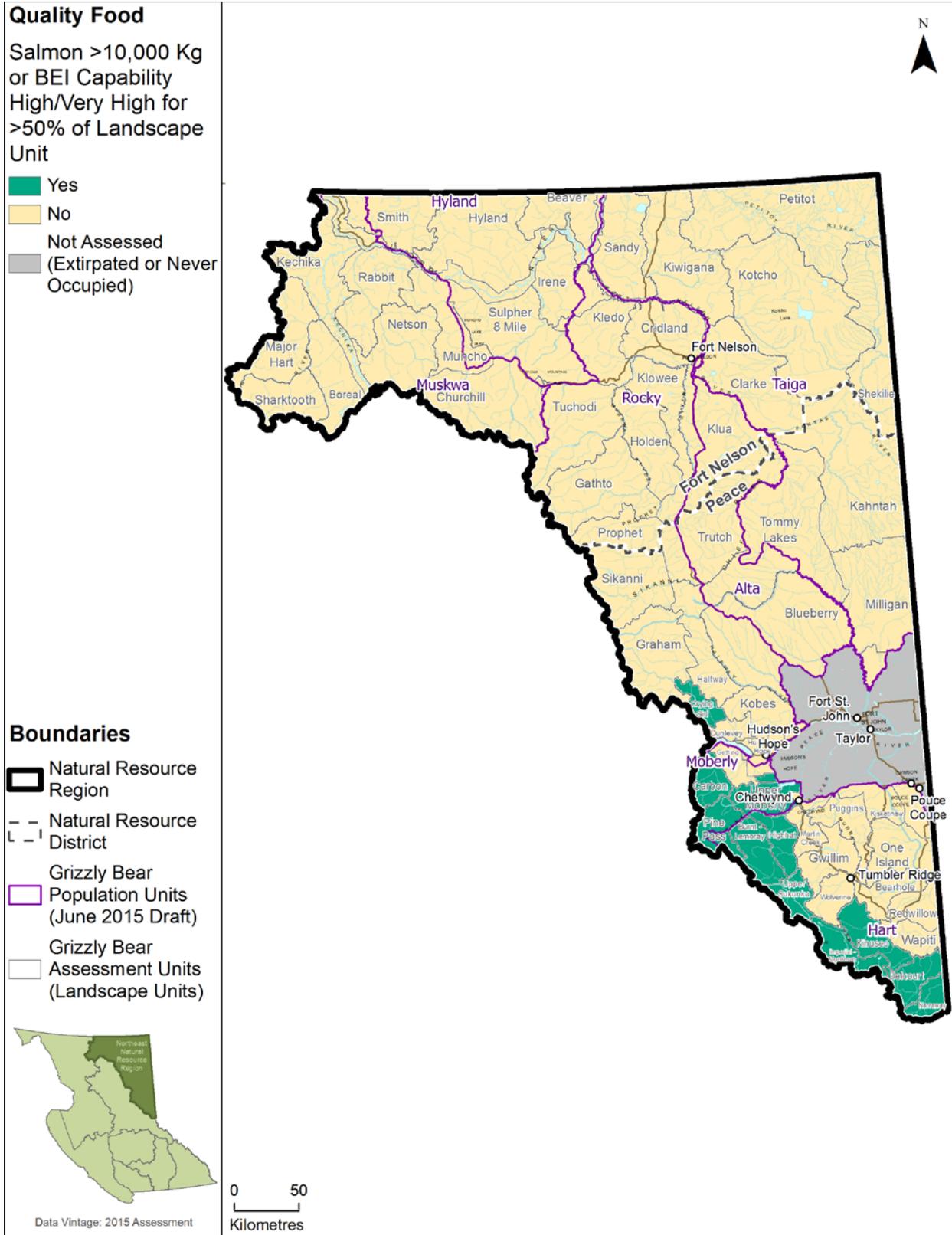


Figure 4.9 Quality Food –Northeast Region

4.10 Lethal Encounter Potential and Quality Food

- Indicator Description:** This indicator reports a combination of three other indicators to provide an overall sense of where the highest risks to grizzly bears are on the land base. It includes high-risk front country areas, high-risk hunter density areas, and high-risk quality food areas within each LU as an overall indicator of heightened risk of bear mortality due to human presence (especially hunters) in key bear habitat (habitat most used by bears).
- Interpretation Key:**
- LUs with greater than 20% of the area in front country and high average annual hunter day density (average annual hunter days greater than 1.5km²) and high capability BEI areas (high vegetation productivity) are high risk to grizzly bears.
- Assessment Results:**
- See Figure 4.10—opposing page

Regional Commentary:

This indicator reports a combination of high-risk front country areas, high-risk hunter-day density areas, and high-risk quality food areas to provide an overall sense of where the highest risks to grizzly bears are on the land base. Areas flagged as high risk include the southern portion of the Rocky GBPU (including the Kobes and Dunlevy landscape units), and most of the Hart GBPU.

It is important to note that results for this indicator *do not* capture areas of high ungulate density, which would likely better represent high-risk quality food areas for Northeast grizzly bears.

Regional assessment: *this indicator has **no precision and no relevance.***

Lethal Encounter and Food Index

- Flagged - Lethal Encounter Potential
- Front Country With Areas Of High Hunter Density Days
- Flagged - Lethal Encounter Potential
- With The Occurrence Of Quality Food
- Not Flagged
- Not Assessed (Extirpated or Never Occupied)

Boundaries

- Natural Resource Region
- Natural Resource District
- Grizzly Bear Population Units (June 2015 Draft)
- Grizzly Bear Assessment Units (Landscape Units)



Data Vintage: 2015 Assessment



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Figure 4.10 Lethal Encounter Potential and Quality Food – Northeast Region

4.11 Quality Habitat Protected

Indicator	Quality habitat protected has two indicators:
Description:	<p>1. Habitat capability. This indicator reports the amount of high and very high capability grizzly bear habitat within a LU that is under some form of legal protection (e.g., parks, wildlife management areas, old growth management areas). Capable habitat is habitat that under optimal natural conditions will provide grizzly bear life requisites. Habitat capability for grizzly bears is categorized into six classes from very high to nil in the BEI.</p> <p>2. Wildlife habitat areas. This indicator reports the presence or absence of grizzly bear WHAs within a LU.</p>
Interpretation Key:	<p>Habitat capability:</p> <ul style="list-style-type: none"> • 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. <p>Wildlife habitat areas:</p> <ul style="list-style-type: none"> • If > 0.05% of the LU comprises grizzly bear WHAs, WHAs are present. • If <0.05% of the LU comprises grizzly bear WHAs, WHAs are absent.
Assessment Results:	See Figure 4.11—opposing page

Regional Commentary:

In the Northeast region, landscape units with 60% or more of high-capability grizzly bear habitat protected (e.g., in parks, wildlife management areas, old growth management areas, and WHAs for other species) are limited to Muskwa, Rocky, and Hart (southernmost tip only) GBPUs.¹⁸ In contrast, Hyland, Taiga, Alta, Rocky, Moberly and Hart GBPUs have large areas with minimal to no conservation of grizzly bear habitat. In particular, there are **no grizzly bear WHAs in the Northeast region.**¹⁹

Regional specialists indicate that habitat capability for grizzly bears in the Northeast may be underestimated given insufficient baseline data. For instance, recent terrestrial ecosystem mapping (TEM) in the Moberly GBPU found several polygons with high capability habitat²⁰ and some signs of grizzly bear presence. As such, mapping of grizzly bear habitat capability throughout the region is a high priority for next steps.

¹⁸ Within Muskwa and Rocky GBPUs, featured areas that are protected or have land use restrictions include: Muskwa-Kechika Management Area, Muncho Lake Park, Stone Mountain Provincial Park, Northern Rocky Mountains Provincial Park, Redfern-Keily Provincial Park, and Graham Laurier Provincial Park. The primary protected area in the lower Hart GBPU is Kakwa Provincial Park.

¹⁹ Recent [TEM mapping](#) in the Moberly GBPU (see also Section 6.2) will inform potential future grizzly bear WHAs in that GBPU. Further validation work in the Moberly GBPU is proposed for 2018-19.

²⁰ For example, old regenerating burns, berry-covered meadows, alpine habitat, flood plains, and wetlands.

Protected versus unprotected areas within each GBPU are described in Appendix 3 – Table 4.

Regional assessment: *this indicator has high precision and high relevance.*

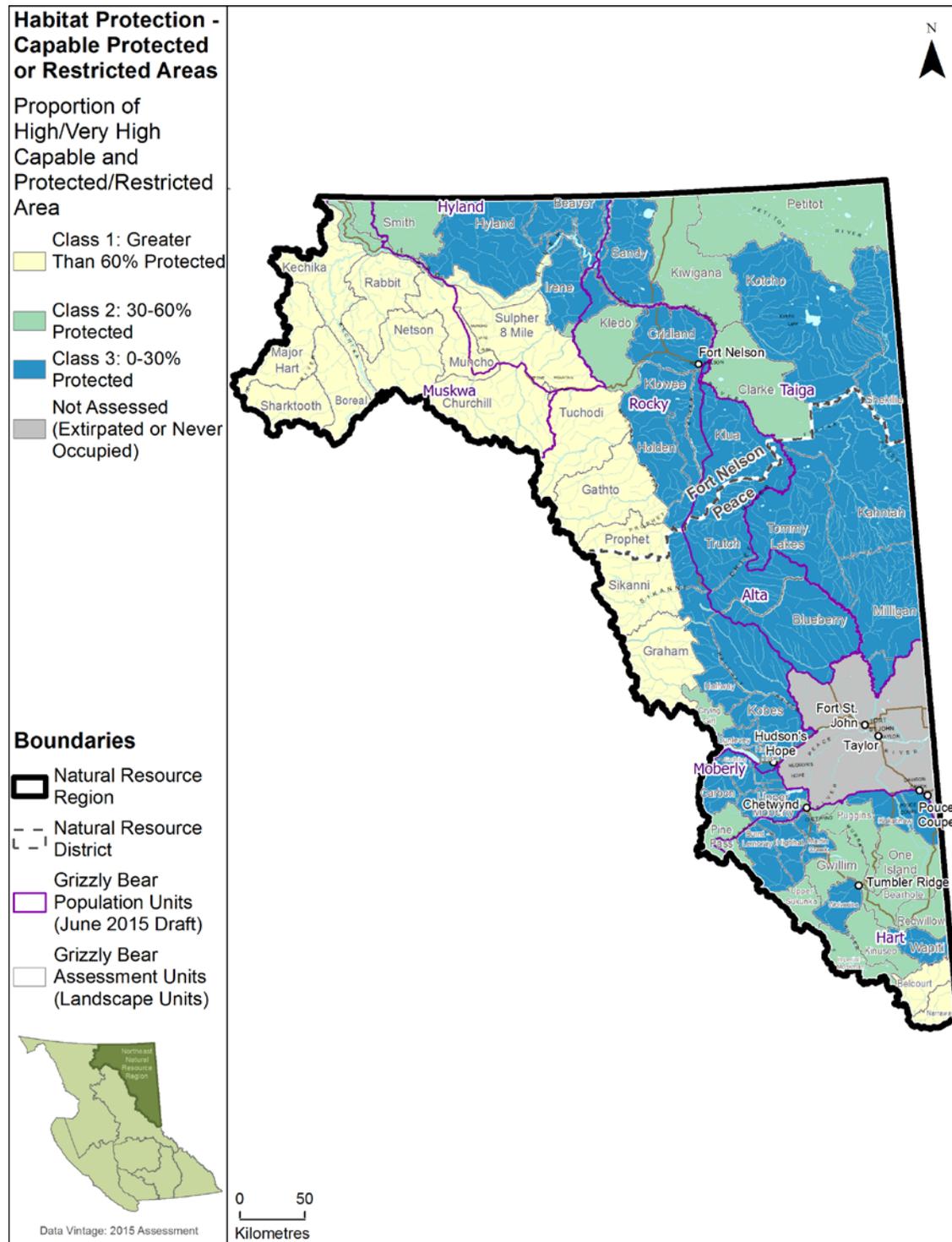


Figure 4.11 Quality Habitat Protected – Northeast Region

5 Interpretation and Key Drivers of Results

The following section provides a concise summary of the assessment results for the indicator results along with an interpretation of the key drivers that are influencing these results. Regional commentary is provided to identify where attention is needed to improve assessment results for the Northeast region. Finally, potential next steps for improving and enhancing grizzly bear populations and habitat in the region are summarized.

5.1 Summary of Assessment Results

Based on their assessment of the above 11 indicators, regional specialists suggest resource managers focus attention on the highest utility indicators: core security area, hunter day density, road density, and quality habitat protected.

Further research on grizzly bear diet, habitat use and selection, and human access (e.g. utilization of seismic lines) is needed to validate indicator results and to determine appropriate next steps to manage and conserve grizzly bear populations and habitat in the Northeast.

In addition to the indicators assessed in this report, other indicators worth exploring in the Northeast region include: agricultural land density, amount of high elevation habitat, presence of black bears in grizzly bear habitat (competition), and threats associated with backcountry recreation.

Future environmental and industrial trends will be important to consider when determining next steps for managing grizzly bear populations and habitat in the Northeast. For example:

- past logging will create more closed-canopy forests in future, which are not suitable grizzly bear habitat;
- continued industrial and urban expansion would further reduce viable grizzly bear habitat, especially in the Moberly and Hart GBPU; and,
- effects of climate change on grizzly bears are uncertain, but some possible effects may increase the risk for human bear conflict.

Recent Government decisions to develop a provincial grizzly bear management plan, to ban hunting of grizzly bears across the province, and to modernize land use plans will be instrumental in informing the Northeast region's actions to address this report. For example, strategic landscape-level planning across the region will be the most valuable way to engage agencies and stakeholders in assessing options for reducing identified threats to grizzly bears in areas of high capability grizzly bear habitat where appropriate.

5.2 Consideration of other Relevant Information

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

- Madrone Environmental Services, 1998, [Terrestrial ecosystem mapping and wildlife interpretations for the Dunedin study area](#). This report provides ecosystem mapping for the Dunedin area (Muskwa Plateau and Northern Rocky Mountains), including the ecology and habitat requirements of grizzly bears in the area to support forest management planning.

- Madrone Environmental Services, 1998, [Ecosystem mapping and wildlife interpretations for the La Biche and Sandy Creek areas of Northeastern BC](#). This report provides terrestrial ecosystem mapping for the La Biche and Sandy Creek areas of the Northeast (located on the Fort Nelson Lowland of the Alberta Plateau, east of the Northern Rocky Mountains). The report includes the ecology and habitat requirements of grizzly bears in this area to support forest management planning.
- Poole et al, 2001, [DNA-based population estimate for grizzly bears in Northeastern British Columbia. This report summarizes research on grizzly bear populations in the Northern Boreal Mountains and Taiga Plains using hair removal to sample bears, microsatellite profiling to identify individuals, and mark-recapture models. The results support population estimates derived from habitat capability/suitability modelling.](#)
- EBA Engineering Consultants, 2002, [Ecosystem Mapping with wildlife interpretations to support oil and gas pre-tenure planning in the Muskwa-Kechika Management Area](#). This report provides predictive ecosystem mapping for the Muskwa-Kechika Management Area, including the ecology and habitat requirements of grizzly bears to support oil and gas pre-tenure planning in the area.
- Milakovic, 2011, [Seasonal Habitat Use and Selection by Grizzly Bears in Northern British Columbia](#). This article provides an overview of seasonal habitat use and selection by grizzly bears in the Besa-Prophet watershed (Northern Boreal Mountains), and confirms the importance of ungulate meat in the diet of grizzly bears in this area [From *Journal of Wildlife Management* 76(1): 170-180].
- Milakovic, 2012, [Quantifying Carnivory of Grizzly Bears in a Multi-Ungulate System](#). This article discusses seasonal variation in the diet of northeastern grizzly bears, and confirms that large ungulates (primarily elk) constitute 51% of the fall diet of males and 32% of the fall diets of females. [From *Journal of Wildlife Management* 77(1): 39-47].
- BC Government, 2012, [Grizzly bear population status in BC](#).
- 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.
- Apps, 2013, [Assessing cumulative impacts to wide-ranging species across the Peace Break Region of Northeastern BC](#). This report provides a useful synthesis and analysis of cumulative effects research on a variety of species, including grizzly bears, to inform an environmental assessment of the proposed Site-C hydro-electric development. In particular, the report provides an overview (page 62) of the landscape potential for grizzly bears across the Peace Break regional and local assessment areas.
- 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.
- BC Government, 2016, [Prince George TSA: Grizzly bear assessments summary and landscape unit selection for enhanced grizzly bear conservation sensitivity analysis](#). Although this report does not analyze GBPUs in the Northeast region, it includes commentary on adjacent GBPUs that may be useful.
- NWT Species at Risk Committee, 2017, [Species Status Report for Grizzly Bears in the Northwest Territories](#). This report discusses the status of grizzly bear populations and habitat in the Northwest

Territories. Given the continuity of habitat between Northeast BC and the Northwest Territories, this report may be useful for better understanding Northeast grizzly bears, especially in the Taiga Plains.

- Madrone Environmental Services, 2016, [Interim Project Report: Moberly Ecosystem Mapping to Inform Grizzly Bear Wildlife Habitat Area Designations](#). **Note:** a draft report is anticipated in March 2018.
- BC Auditor General, 2017, [An Independent Audit of Grizzly Bear Management](#).
- BC Government, 2018, Natural Resource Stewardship Monitoring and Assessment Report for the Peace Natural Resource District (add reference upon publication). This report provides additional insights into the status of GBPU's in the Peace District, using the NatureServe²¹ risk-ranking methodology.

5.3 Potential Next Steps

Based on the results outlined in this report, resource specialists and decision-makers may wish to consider the following opportunities to enhance grizzly bear populations and habitat in the Northeast region:

- Conduct research, inventory, and monitoring to refine the region's understanding of grizzly bear populations, density, habitat use, diet, and threats, especially in higher-risk GBPU's.
- Based on analysis of research, inventory and monitoring outcomes, consider the following actions to reduce risks to grizzly bear populations and habitat:
 - establish grizzly bear wildlife habitat areas in locations where grizzly bear habitat capability is high but populations are threatened by the combined effects of high road density, high hunter day density, and low core security areas;
 - deactivate and/or restrict access on roads and corridors in high priority grizzly bear habitat, especially in areas where human infrastructure/activity is impacting the ability of grizzly bears to travel across their range (i.e., to connect and enhance core security areas);
 - adjust forest planning and practices (including prescribed fire) in priority grizzly bear habitat with a view to conserving or enhancing seasonal foraging habitats (e.g., berry production); and,
- As part of any new land use planning initiatives in the Northeast, prioritize access management planning across the region with a view to minimizing new roads and decommissioning old roads in areas of wildlife conservation priority.

In addition to the references noted in the last section, 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 Northeast BC.

- BC Government, 1995, [Conservation of Grizzly Bears in British Columbia](#)
- BC Government, 2004, [Accounts and Measures for Managing Identified Wildlife \(Grizzly Bear\)](#)
- BC Government plans:
 - [Fort Nelson Land and Resource Management Plan](#) (1997)

²¹ See Footnote 10 for a description of the NatureServe methodology.

- [Fort St John Land and Resource Management Plan](#) (1997)
- [Muskwa-Kechika Management Area Plan](#) (1998)
- [Dawson Creek Land and Resource Management Plan](#) (1999)
- [Fort St John Pilot Project Sustainable Forest Management Plan](#) (2001)
- [Peace Moberly Tract Draft Sustainable Forest Management Plan](#) (2006)
- [Graham Laurier Provincial Park Management Plan](#) (2011)
- BC Government, 2001, [Be a Bear Smart Community](#) (and other [Bear Smart Resources and Publications](#)).
- BC 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](#).
- BC Government, 2014, [Develop with Care: Environmental Guidelines for Urban and Rural Land Development in BC \(Section 5.3, Northeast Region\)](#).
- BC 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](#).
- BC Government, 2016, [Adapting natural resource management to climate change in the Northeast Region: Considerations for practitioners and Government staff](#).
- BC Government, 2016, [Climate Change Vulnerability of BC's Fish and Wildlife: First Approximation](#).

Appendix 1—Grizzly Bear Backgrounder

Species Information

Grizzly bears are highly mobile omnivores with large spatial requirements. Grasslands and shrublands integrated with forests, subalpine meadows and forests, and alpine communities are typical grizzly habitat.

Grizzlies feed on a wide variety of plants, switching during the year depending on availability and abundance. Grizzly diet in spring and early summer consists mainly of forbs, grasses, sedges and other green vegetation. Moist fens and riparian areas produce high densities of prime summer vegetation. In late summer and fall, berries²² and roots are an important additional component of their diet.

Ridgetops, talus slopes, avalanche chutes, creek/river bottoms, fluvial and alluvial floodplains, wetlands and riparian areas are seasonally important foraging areas. Reclaimed well sites, pipeline and seismic corridors, and road sites are also utilised seasonally, as human-disturbed sites tend to support early succession vegetation which is favoured by grizzly bears. Other important feeding areas include logged areas where seral plant communities are abundant. The capacity of most Northeast ecosystems to produce abundant vegetation for grizzly bears is limited by low annual rainfall and a shorter growing season (especially in the Boreal and Taiga Plains and the Northern Boreal Mountains). As such, highly productive vegetation is limited to the Sub-Boreal Interior and Southern Interior Mountains.

Animal matter such as ants, ground squirrels, and young, weak or old ungulates are taken opportunistically. In the Northeast, research (Milakovic, 2011 & 2012) has found that ungulates (primarily elk but also moose, deer, woodland caribou, and Stone’s sheep) are an important food source for grizzly bears throughout the year but especially in the fall; however, more research is needed to determine the extent to which ungulate meat contributes to the density and productivity of grizzly bear populations throughout the Northeast. Unlike other regions of BC, the Northeast does not have salmon-bearing streams, so salmon is not a food source for Northeast bears.

In addition to suitable feeding areas, grizzlies require forest cover for security and bedding. Grizzly den sites vary from alpine/subalpine talus slopes, shrubfields and krummholz²³ areas to various timbered subalpine and lowland areas. Most dens are located to ensure early and long-lasting snow cover for insulation. Mountain valley bottoms (riparian habitats) and ridgetops serve as travel corridors throughout a grizzly’s home range. Corridors connect different habitat units, preventing isolation and enabling bears to travel to key food sources.

Species Status

Grizzly bears are a species of “special concern” in Canada²⁴, given their sensitivity to human activities and disturbance. Under BC’s Conservation Framework, grizzly bears are a high priority for conservation. In Northeast BC, grizzly bear populations are considered viable in all areas except the Peace River

²² Northeast grizzly bears consume a variety of berries, including soopolallie, huckleberry, Saskatoon, highbush cranberry, choke cherry, currants, bearberry and crowberry.

²³ Krummholz are areas of stunted windblown trees growing near the tree line on mountains.

²⁴ COSEWIC, 2002, [Assessment and Update Status Report on the Grizzly Bear in Canada \(Prairie and Northwestern Population\)](#).

lowlands, where they are extirpated due to habitat loss associated with agriculture and human settlement areas.

There are seven grizzly bear population units (GBPUs)²⁵ in the Northeast. From north to south, they include Muskwa, Hyland, Rocky, Taiga, Alta, Moberly²⁶, and Hart. Of note, the Taiga, Alta and Moberly GBPUs have relatively low densities of grizzly bears (less than 10 bears per 1000 square kilometres).

It is important to note that grizzly bear population estimates for the Northeast region are uncertain because the provincial [regression model](#) used to estimate bear density in interior ecosystems uses an indicator (plant productivity based on rainfall) that is not well-represented in the Northeast, and because there are limited grizzly bear inventories to verify the accuracy of model-generated estimates. This topic is explored further under Section 4.2 (assessment results for the 'bear density' indicator).

Threats to Grizzly Bears

In the Northeast region, natural resource development and expansion – primarily associated with a booming energy sector, agriculture, and forestry – is the most significant threat to grizzly bears. Areas already intensively disturbed from industrial activity include areas around the cities of Fort St John and Dawson Creek, and areas along the Alaska Highway.

Natural resource activities disturb grizzly bear habitat, contributing to its loss, alteration and fragmentation over time. Secondly, the roads and corridors associated with these activities enable humans to access grizzly bear habitat, which in turn increases the risk of human-caused bear mortality.

Historically, agriculture in the Northeast has resulted in the conversion of forests to croplands and pastures, which has led to loss, alteration and fragmentation of grizzly bear habitat. As well, grizzly bears are attracted to livestock and grain crops as food sources, increasing the potential for bear mortality if they become a nuisance to rural farmers and ranchers. The combined effect of agriculture and human settlement has led to local extirpation of grizzly bears in the Peace River lowlands.²⁷

Linear corridors (roads, seismic lines, transmission lines, and pipeline corridors) are widespread across most of the Northeast region, largely due to an expanding oil and gas sector. They connect previously disconnected watersheds, and those that are permanent (or that remain open past their industrial shelf-life because remediation is not legally required) are used by guide-outfitters, hunters, trappers, and backcountry recreation enthusiasts. Linear corridors are most prominent in the northeast portion of the region, within the Taiga and Alta GBPUs.

Research (Stenhouse et al, 2013) indicates that grizzly bears also use linear corridors for foraging, anting, digging, berry feeding, bedding and travel. As well, given their curious and food-driven nature, grizzly bears are also drawn to hunter kills, human camps, and garbage.

²⁵ 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.

²⁶ The Moberly GBPU overlaps the Northeast and Omineca regions (about 85% of the GBPU is located within the Northeast region).

²⁷ Note that recovery of grizzly bear populations in this urban/agricultural area would not be desirable given that the area is 'front country' and therefore provides sub-optimal bear habitat, and given the increased likelihood of human-bear conflicts.

Not surprisingly, a direct predictor of threats to grizzly bears is human access to grizzly bear habitat, and the behaviour of individuals who enter bear habitat (including whether they carry firearms). In the Northeast, the increasing density of roads and other linear corridors increases the potential for bear mortality (due to hunting, human-bear conflicts, poaching, or collisions with vehicles and trains), and displacement of bears from their preferred habitats due to noise and human activity.²⁸

In addition to linear corridors, river boats and helicopters are used by adventure recreation operators, guide-outfitters, trappers and outdoor enthusiasts to access the backcountry. In fact, many of the Northeast's river systems (as well as Williston Lake) are major recreation corridors.²⁹

Hydro-electric dams and associated reservoirs (e.g., Williston reservoir), and run-of-the-river developments, in the Northeast also affect grizzly bears. Reservoirs located in grizzly bear habitat impact the ability of bears to travel across their range, and loss of riparian forests reduces their thermal cover and food sources. In the Northeast, dams on the Peace River have caused more habitat loss to date than any other industrial activity.

The anticipated effects of climate change on grizzly bears in the Northeast

The climate in the Northeast has changed more rapidly over the past century than the rest of the province, and is expected to continue to change. Projections suggest the region may warm, on average, 1.8 to 4.6°C by the end of this century, similar to moving from Fort St. John to Williams Lake or Fort Nelson to Prince George (2.2° and 4.4°C warmer respectively). Climate change will likely have both positive and negative effects on Northeast grizzly bears. On the positive side, warmer temperatures and less spring snowfall will bring about earlier spring conditions and a longer growing season, which may favour summer vegetation grizzly bears rely on. For example, predicted increases in wildfire in the region could enhance berry productivity. Research in Alberta's Rocky Mountain region (Nielsen, 2013) has found a correlation between warmer temperatures, especially during late winter and spring, and larger grizzly bears, which may bode well for the future of Northeast grizzly bears.

*However, the broader effects of climate change on wildlife species ranges, predator-prey relationships, and food supply are largely uncertain, and could negatively affect the future viability of Northeast grizzly bears. For example, the Northeast region is expected to experience more extreme weather, including late-season drought, which could negatively impact fall vegetation production. As well, under a changing climate, human land uses and species habitat ranges will likely expand and/or shift, increasing the potential for human-bear conflicts. For more information on the anticipated effects of climate change on ecosystems in the Northeast region, see *Adapting natural resource management to climate change in the Northeast Region: Considerations for practitioners and Government staff (2016)* and *Climate Change Vulnerability of BC's Fish and Wildlife: First Approximation (2016)*.*

²⁸ 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 an important research priority.

²⁹ The impacts of rivers and large lakes as access corridors to bear habitat is not well understood and little data is available. As such, river and lake access points are not included in the access-oriented indicators analyzed in this report.

Objectives and Legal Protection

In BC and the Northeast region, management and conservation of grizzly bears is governed by a number of provincial and regional strategies, legislation, land use plans, 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 BC for future generations.”

Under the *Forest and Range Practices Act (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 wildlife habitat areas and wildlife measures for grizzly bears in areas of high conservation priority. At this time, no wildlife habitat areas have been established for grizzly bears in the Northeast region.³⁰ However, [grizzly bear accounts and measures](#) provide provincial policy guidance to inform forest and range planning and practices within grizzly bear habitat.

Land use plans in the Northeast region establish resource management objectives and strategies for maintaining grizzly bear habitat and protecting bear populations on Crown lands. These plans include:

- Land and resource management plans for the Fort Nelson, Fort St John, and Dawson Creek districts;
- Management plans for special resource management areas and protected areas, including Muskwa-Kechika Management Area and Graham Laurier Provincial Park;
- A sustainable forest management plan for the Fort St John Pilot Project Area (which is subject to a regulation under FRPA); and,
- A sustainable resource management plan for the Peace Moberly Tract (located within the district of Hudson’s Hope).

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 of Crown lands. They generally call for:

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

³⁰ In large part, this is because conservation of forested habitat for wildlife (and consequent constraints on the timber harvesting land base) was deemed a higher priority for ungulates (e.g., caribou, Stone’s sheep) and fur-bearers (fisher) when land use plans were developed in the Northeast region 20 years ago. However, the region is currently developing a proposal to establish WHAs for grizzly bears in the Moberly GBPU.

In December 2017, the BC Government announced a provincial ban on grizzly bear hunting (other than hunting by First Nations for food, social and ceremonial purposes). Up until this time, hunting of grizzly bears was highly restricted under the provincial *Wildlife Act*. And, since 2001, grizzly bear hunting was not permitted in threatened GBPUs or in GBPUs with low bear population densities (i.e., the number of bears per 1000 km²).³¹ Where hunting was allowed, it was managed through limited entry hunts. In the Northeast region, hunting was not permitted in the Peace River lowlands (an extirpated area) and within the Moberly and Taiga GBPUs (units with low bear population densities). Given that direct human-caused grizzly bear mortality in the Northeast (especially in the northern part of the region) has largely been due to hunting, hunting regulations have (until recently) been an important legal tool for managing and recovering at-risk grizzly bear populations.

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. The *Land Act* (section 66), the *Forest and Range Practices Act* (sections 22.2 and 58), and the *Motor Vehicle (All Terrain) Act* (section 7) also enable 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.

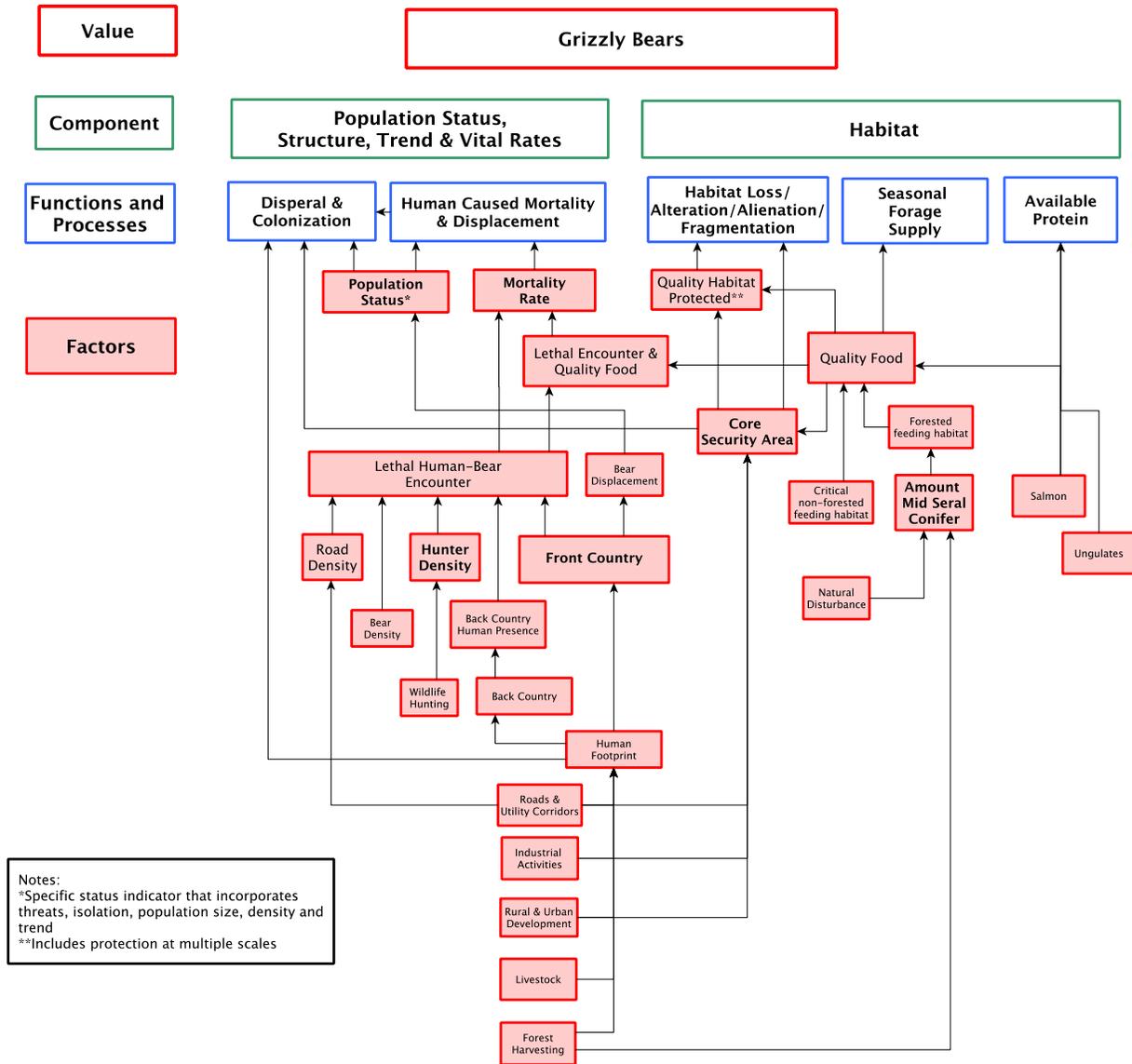
Major industrial projects – such as mines, pipelines, and hydropower generation projects – are the biggest threat to the future viability of Northeast grizzly bears. As such, the most important legal tool for protecting grizzly bear populations and habitat in the Northeast is the environmental review 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 that specify actions to mitigate impacts of the project to grizzly bear populations and habitat.

In October 2017, the BC 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 grizzly bear habitat. Government 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 BC. In turn, this plan will inform the Northeast region's actions to sustain grizzly bear populations and habitat across the region. The December 2017 decision to ban grizzly bear hunting across the province may further assist the Northeast region in sustaining grizzly bear populations.

³¹ As per [British Columbia Grizzly Bear Population Estimate for 2012](#), FLNRO, April 2012.

Appendix 2—Conceptual Model for Assessing Grizzly Bears

This diagram illustrates how the indicators (which are a sub-set of the factors shown in the diagram)³² influence the functions and processes that support grizzly bear populations and habitat in B.C.



³² The **bolded** factors (population status, mortality rate, hunter density, front country, core security area, and amount mid seral conifer) are *core indicators*, meaning they are the *primary* indicators used to assess potential risks to grizzly bears. *Supplementary indicators* were also assessed to provide important context information to support decision-making; the supplementary indicators are bear density, road density, quality food, lethal encounter potential and quality food, and quality habitat protected.

Appendix 3—Indicator Tables

In the tables below, the size and area (%) of the core security, front and back country, road density and quality habitat protected indicators are summarized by GBPU.

Table 1 - Core Security Area by GBPU

GBPU	Core/Non-core	Size (Km ²)	% Area
Muskwa	Core	30,618	87
	Non-core	4,573	13
Hyland	Core	14,058	82
	Non-core	3,163	18
Rocky	Core	20,475	54
	Non-core	17,184	46
Taiga	Core	15,150	31
	Non-core	34,348	69
Alta	Core	2,527	20
	Non-core	10,605	80
Moberly	Core	4,013	53
	Non-core	3,509	47
Hart	Core	7,095	36
	Non-core	12,407	64

Table 2 - Front Country by GBPU

GBPU	Front/Back	Size (Km ²)	% Area
Muskwa	Front country	2,556	7
	Back country	32,636	93
Hyland	Front country	2,253	13
	Back country	14,967	87
Rocky	Front country	14,210	38
	Back country	23,444	62
Taiga	Front country	11,940	24
	Back country	37,531	76
Alta	Front country	7,718	59
	Back country	5,463	41
Moberly	Front country	5,026	67
	Back country	2,492	33
Hart	Front country	14,867	76
	Back country	4,616	24

Table 3 - Road Density by GBPU

GBPU	Grid Class (km/km ²)	Size (Km ²)	% Area*
Muskwa	0	33,750	96
	0.1 – 0.3	116	0
	0.31 – 0.6	143	0
	0.61 – 0.75	79	0
	0.76 – 1.25	390	1
	1.26 – 1.75	355	1
	1.76– 2.5	145	0
	>2.5	214	1
Muskwa total		35,191	20
Hyland	0	14,932	88
	0.1 – 0.3	267	1
	0.31 – 0.6	277	2
	0.61 – 0.75	125	1
	0.76 – 1.25	515	3
	1.26 – 1.75	436	2
	1.76– 2.5	232	1
	>2.5	436	2
Hyland total		17,221	11
Rocky	0	25,638	74
	0.1 – 0.3	1,224	3
	0.31 – 0.6	1,197	3
	0.61 – 0.75	566	1
	0.76 – 1.25	2,238	5
	1.26 – 1.75	2,017	4
	1.76– 2.5	1,303	3
	>2.5	3,472	7
Rocky total		37,654	25
Taiga	0	22,476	45
	0.1 – 0.3	2,694	5
	0.31 – 0.6	2,531	5
	0.61 – 0.75	1,217	2
	0.76 – 1.25	5,689	11
	1.26 – 1.75	4,521	9
	1.76– 2.5	3,076	6
	>2.5	7,267	15
Taiga total		49,471	4
Alta	0	4,437	34
	0.1 – 0.3	805	6
	0.31 – 0.6	782	6
	0.61 – 0.75	361	3
	0.76 – 1.25	1,466	11
	1.26 – 1.75	1,340	10
	1.76– 2.5	1,015	8
	>2.5	2,975	23
Alta total		13,180	6

GBPU	Grid Class (km/km ²)	Size (Km ²)	% Area*
Moberly	0	4,673	62
	0.1 – 0.3	167	2
	0.31 – 0.6	178	2
	0.61 – 0.75	89	1
	0.76 – 1.25	369	5
	1.26 – 1.75	411	6
	1.76– 2.5	347	5
	>2.5	1,284	17
Moberly total		7,518	3
Hart	0	9,827	54
	0.1 – 0.3	644	3
	0.31 – 0.6	659	3
	0.61 – 0.75	320	2
	0.76 – 1.25	1,287	6
	1.26 – 1.75	1,315	6
	1.76– 2.5	1,062	5
	>2.5	4,368	20
Hart total		19,483	11
Regional total		179,719	100

*For these columns, the total score represents the percent (area or bears) of the regional total that is within the GBPU.

Table 4 – Quality Habitat Protected by GBPU

GBPU	Protected*/Not Protected	Size (Km ²)	% Area
Muskwa	Protected	31,251	88
	Not protected	4,153	12
Hyland	Protected	6,366	37
	Not protected	10,877	63
Rocky	Protected	20,711	55
	Not protected	16,957	45
Taiga	Protected	14,854	30
	Not protected	34,648	70
Alta	Protected	1,632	12
	Not protected	11,549	88
Moberly	Protected	2,359	31
	Not protected	5,175	69
Hart	Protected	10,595	54
	Not protected	8,922	46

*Protected areas include: protected areas, ecological reserves, management areas, provincial parks, forest recreation sites, old growth management areas, ungulate winter ranges, areas reserved for public use, areas subject to visual quality objectives, and wildlife habitat areas.

Appendix 4 – Data

Please see the following link to access this [Dataset](#) and metadata from British Columbia's Data Catalogue. You can also view this dataset on the [BC Map Hub](#) and on British Columbia's map viewer [iMapBC](#).

Please visit the [Provincial Cumulative Effects Framework website](#) for more information and to view reports for other regions of B.C.