Prince George Timber Supply Area: Grizzly Bear Assessments Summary & Landscape Unit Selection for Enhanced Grizzly Bear Conservation Sensitivity Analysis

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Introduction

This report provides a summary of Provincial Grizzly Bear Assessments for the Prince George (PG) Timber Supply Area (TSA). The summary uses two sources of information. The first is the Province's grizzly bear current condition assessment developed as a component of the Cumulative Effects Value Foundation. Detail on the methods and data used in that assessment can be found in the Provincial Scale Grizzly Bear Assessment Protocol[1]. The second comes from the Province's on-going NatureServe grizzly bear population unit ranking project.

Reporting Unit Summary Statistics

There are 8 Grizzly Bear Population Units (GBPUs) that significantly overlap with the PG TSA; Francois, Nulki, Nation, Blackwater-West Chilcotin, Omineca, Parsnip, Robson and Upper Skeena-Nass. These units cover 97% of the TSA's area. There are several GBPUs that have minor overlaps (<10% of GPBU area) with the TSA that were not considered in this summary, these include; Tweedsmuir, Spatsizi, Quesnel Lake North, Hart, Babine and Cranberry (Table 1).

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[1] Provincial Grizzly Bear Technical Working Group. 2016. Assessment Methods for Grizzly Bears in BC (Tier 1 Provincial Scale Grizzly Bear Assessment Protocol) Standards for British Columbia's Values Foundation (ver. 2.2; March 24, 2016). 42 pp.

Table 1. Area summary of Grizzly Bear Population Units (GBPUs) that overlap the Prince George Timber Supply Area.

Grizzly Bear Population Unit	Area (ha)	TSA Overlap (ha)	TSA Overlap (%)	GBPU % of TSA
Spatsizi	2,170,178	4,848	<1	0.06%
Finlay-Ospika	3,076,763	2,106	<1	0.03%
Upper Skeena-Nass	**1,699,932**	**898,208**	**53**	**11.28%**
Omineca	**3,002,176**	**1,188,973**	**40**	**14.93%**
Cranberry	1,177,337	21,113	2	0.27%
Babine	1,432,261	101,471	7	1.27%
Parsnip	**1,099,617**	**1,025,667**	**93**	**12.88%**
Nation	**1,868,695**	**1,738,307**	**93**	**21.82%**
Francois	**870,173**	**181,681**	**21**	**2.28%**
Robson	**2,003,579**	**608,283**	**30**	**7.64%**
Tweedsmuir	1,936,644	139	<1	0.00%
Blackwater-West Chilcotin	**2,266,222**	**443,101**	**20**	**5.56%**
Quesnel Lake North	937,537	821	<1	0.01%
Hart	1,966,122	34,358	2	0.43%
Nulki	**1,679,753**	**1,675,610**	**100**	**21.04%**
Extirpated	6,649,327	40,868	1	0.51%
Total	33,836,317	7,965,555		100.00%

Provincial Current Condition Indicator Summary[2]

Assessment Scale

The Provincial grizzly bear current condition assessment considers two spatial scales; Grizzly Bear Population Units (GBPUs – sometimes subdivided by wildlife management units (WMU), limited entry hunting (LEH) zones and parks) and Landscape Units (LUs)).

Across much of the province, GBPUs are not isolated populations, but form one large meta-population. GBPUs are used for conservation and management, but only a few reflect unique biological populations. Similarly WMU and the LEH Zones may capture aspects of bear ecology, but are primarily intended for management purposes, such as setting grizzly bear harvest allocations.

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[2] Text is adopted from protocol[1] and Provincial Cumulative Effects Grizzly Bear Value Summary: August 2016. http://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/cumulative-effects/grizzly_bear_value_summary_april_27_final.pdfeffects/grizzly_bear_value_summary_april_27_final.pdf

Assessments characterize risk to the abundance and distribution of grizzly bears within each management unit (i.e., GBPU/WMU/LEH scale) and are intended to reflect regional variation in population management and grizzly bear population ecology.

LUs represent a finer scale and are analogous to the scale of one to several annual female grizzly bear home ranges depending on the size of the landscape unit and quality of the habitat. Habitat and mortality risk indicators can be calculated for each LU. The combination of LUs and indicators within a GBPU/WMU/LEH can be looked at together to infer larger scale effects.

<u>Management Objectives</u>

Under the Province's Cumulative Effects Policy, objectives are the desired condition of a value obtained from existing legislation, policy, land use plans and other agreements that are described in a qualitative or quantitative manner. Objectives for grizzly bears include both broad objectives that are over-arching descriptions of desired conditions that often lack clear definitions and metrics, as well as specific objectives that have metrics directly associated with them.

For grizzly bears the Province considers the following objectives in viable (i.e. non-threatened) GBPUs:

1. At the population scale, ensure Grizzly bear populations are sustainable, including managing for genetic and demographic linkage;
2. Continue to manage lands and resources for the provision of sustainable Grizzly bear hunting and viewing opportunities as informed by research, inventory and monitoring;
3. At the landscape scale, sustain and where appropriate, restore the productivity, connectivity, abundance and distribution of Grizzly bears and their habitats.

<u>Grizzly Bear Components and Indicators</u>

Grizzly bear population and habitat are the two main components of the Provincial current condition assessment. Assessment results can be used for a range of resource management decisions. Further details on methodologies are available in the grizzly bear assessment protocol[1].

The provincial assessment includes a number of indicators of important population and habitat factors that may influence grizzly bears. Where indicators exceed a benchmark, which may indicate a negative effect on grizzly bear, they are "flagged" for closer examination. Some of the indicators are highly correlated (see Appendix 1). Although there may be correlation between some indicators, they address different issues and therefore provide different types of information to aid further investigation into potential cumulative effects to grizzly bear and appropriate management responses.

Mortality Component Indicator

1. Population Status

The population status indicator uses the "viable" or "threatened" definitions, which have been assigned to GBPUs in the province and is reported by Environmental Reporting BC[3]. This status is based on the estimated population size relative to the estimated number of grizzly bears capable of being supported by the habitat. A population unit was flagged if it has a threatened status (such as the Blackwater West Chilcotin GBPU).

2. Human-caused Mortality

Under the Province's grizzly bear harvest management procedure a maximum rate of human caused mortality is established for a GBPU, WMU or LEH zone. To determine a possible amount for harvest, deductions are made for factors, such as unreported mortality. This information is then used to adjust the harvest allocation annually to maintain overall human caused mortality for the allocation period (typically 5 years) at or below the total human-caused mortality limit for hunted units. The assessment protocol uses mortality from the current and past two allocation periods as an indicator of the effects of humans on the grizzly bear populations. The indicator was flagged where human-caused grizzly bear mortality or female mortality were over the total allowable limit in any of these three allocation periods. The indicator can highlight areas where adjustments to hunter harvest (including closing hunts) are not sufficient to keep grizzly bear mortality below allocation limits. These are often areas where grizzly bear mortality from non-hunting sources is high, for example conflict, illegal, road or rail kills. Where this indicator is flagged, further examination is required to determine which allocation periods were exceeded and whether there is an ongoing human-caused mortality concern, perhaps related to area-concentrated mortality from human-bear or bear-livestock conflicts, shifting age class distributions or proportions of females in the kill.

3. Core Security

Core security areas are areas that grizzly bear inhabit with a minimal amount of human use that are large enough to cover the size of average daily movement of an adult female grizzly bear. They are defined as roadless areas of habitat greater than 10 km^2 and are configured such that area to perimeter ratios are high. In these areas, human encounters with grizzly bears are unlikely to occur because of the lack of roads. Secure core habitat is positively correlated with grizzly bear survival rates, particularly for adult females[4]. Landscape units with less than 60% core secure area were flagged.

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[3] http://www.env.gov.bc.ca/soe/
[4] Gibeau, M.L., S. Herrero, B.N. McLellan, and J.G. Woods. 'Managing for Grizzly Bear Security Areas in Banff National Park and the Central Canadian Rocky Mountains'. *Ursus* 12 (2001): 121–30.

4. Hunter Density

General hunter density (i.e., hunters targeting other species than grizzly bear) can influence the amount of grizzly bear mortality due to the potential for lethal encounters with grizzly bears.[5] People out hunting for other wildlife may surprise a grizzly bear or may have a grizzly bear approach their kill or camp, resulting in grizzly bear mortality. The number of hunter days per unit area was calculated using Fish and Wildlife Branch Hunter Sample Surveys, Compulsory Inspection Records, and Guide Outfitter Declarations for each WMU. A unit was flagged if it was in the top 25% of units for hunter days in the province.

5. Likelihood of Human-Bear Encounter

The assessment divided the province into areas with high human occurrence, or *front country*, and areas of lower human occurrence, or *back country.* The division was based on the travel time on different types of roads (e.g., paved, gravel, trails) for people from settlements. Back country areas are more than 2 hour travel time away from a highway. Front country areas have a higher likelihood of human-bear encounters, which can lead to bear displacement as well as bear mortality. LUs were flagged if greater than 20% of the LU is front country area.

Supplemental population indicators

In addition to the indicators above, supplemental population and mortality indicators may be used to assess risk to grizzly bears. These include estimated bear density and road density (km/km^2).

Habitat Component Indicator
1. Mid-Seral Conifer (Forage Supply)

Landscape-level forage supply, such as huckleberry patches, can be critical for grizzly bear populations. Forage supply is often a function of the amount of open vegetation types in a given area. For example, forest canopy openness is a good predictor of berry patches, an important bear food source[6]. Conversely, mid seral conifer dominant forests (roughly 40-100 year old stands depending on ecosystem)[7] can have a dense, closed canopy and are therefore sub-optimal for forage production.

The amount of mid-seral, conifer-dominant dense forest in an assessment area was used as an indicator of low forage supply. Specifically, LUs with greater than 30% closed canopy, conifer-dominated mid-seral forest (by Biogeoclimatic Ecosystem Classification [BEC]

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[5] The effect of ungulate hunters on grizzly bear mortality has been documented, see:
Haroldson, M.A., C.C. Schwartz, S. Cherry and D.S. Moody. 2004. Possible Effects of Elk Harvest on Fall Distribution of Grizzly Bears in the Greater Yellowstone Ecosystem. Journal of Wildlife Management 69(1): 129-137.
[6] Proctor MF, Paetkau D, McLellan BN, Stenhouse BG, Kendall KC, Mace RD, Kasworm WF, Servheen C, Lausen CL, Gibeau ML, Wakkinen WL, Haroldson MA, Mowat G, Apps , Ciarniello LM, Barclay RMR, Boyce MS, Schwartz CC, Strobeck c. 2012. Population fragmentation and inter-ecosystem movements of grizzly bears in Western Canada and the Northern United States. Wildlife Monographs 180:1-46.
[7] Province of British Columbia, 1995. Biodiversity Guide Book. Victoria, British Columbia, Canada.

zone) in either the CWH, SBS, ICH, ESSF, IDF, MS and MH[8] BEC zones, and if those areas compose >10 km^2 of the LU, were flagged. The age-class breaks for mid-seral forest varies by BEC zone and is taken from the Biodiversity Guidebook[9].

Supplemental habitat indicators

In addition to the indicators above, supplemental indicators may be used to assess grizzly bear habitat. Supplemental habitat indicators under the habitat component are food quality (e.g., areas of high salmon biomass in capable grizzly bear habitat) and amount of protected habitat (i.e., capable habitat in various categories of conservation designations).

Provincial Current Condition Indicator Summary

The percent of LUs that are flagged for each GBPU intersecting the PG TSA (and for only the portion that is within the PG TSA) are presented in Table 2. Mortality flags were identified for a number of the GBPUs where both hunting and no-hunting of grizzly bears occurs. Road density is a significant concern for the Francois, Nulki, Nation, Blackwater-West Chilcotin and Robson GBPUs. Core Security and Front Country indicators are also flagged for the same GBPUS. There are high hunter densities in the Nulki, Nation and the Robson GBPUs. High hunter densities could be a concern if it results in a high number of grizzly bear mortalities. The amount of quality food is low in the Nulki, Nation, Blackwater-West Chilcotin and moderate to low in the Francois, Omineca and Upper-Skeena Nass. Forage supply is only a concern in the Francois and Nulki GBPUs. Conservation protection for grizzly bears is lacking in most units with the exception of the Blackwater-West Chilcotin, Robson and Parsnip GBPUs. The Upper-Skeena Nass is the only GBPU that intersects the TSA that has designated grizzly bear Wildlife Habitat Areas (WHA).

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[8] Coastal Western Hemlock; Sub-Boreal Spruce; Interior Cedar-Hemlock; Engelmann Spruce-Subalpine Fir; Interior Douglas-fir; Montane Spruce; Mountain Hemlock.
[9] Biodiversity Guidebook. 1995. https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/biodiv/biotoc.htm

Table 2. Summary of Provincial Grizzly Bear Assessment indicators for the GBPUs intersecting the PG TSA.

Indicator	%LUs Flagged	Nulki	Nation	Black-water-West Chilcotin	Omineca	Parsnip	Robson	Upper Skeena-Nass	Francois	PG TSA
Mortality	GBPU	94	83	100	18	37	71	13	9	62
	TSA	94	90	100	46	29	88	0	33	
Road Density	GBPU	100	100	80	44	26	52	7	100	66
	TSA	100	100	100	38	24	100	0	100	
Core Security Areas	GBPU	100	96	80	36	16	42	7	91	62
	TSA	100	95	100	23	18	100	0	100	
Front Country	GBPU	100	88	54	41	37	94	13	100	66
	TSA	100	90	40	69	29	100	0	100	
Hunter Density	GBPU	100	71	0	0	21	32	0	9	45
	TSA	100	71	0	0	24	75	0	33	
Lack of Quality Food	GBPU	88	79	100	74	0	19	67	73	61
	TSA	88	76	100	62	0	38	80	67	
Mid-Seral	GBPU	29	0	14	3	5	0	0	36	7
	TSA	29	0	0	8	0	0	0	33	
Lack of Habitat Protection	GBPU	100	88	54	87	21	45	87	91	74
	TSA	100	86	80	85	24	50	80	100	
Lack of WHA	GBPU	100	100	100	100	100	100	80	100	100
	TSA	100	100	100	100	100	100	100	100	

Grizzly Bear Population Draft Management Ranking Summary

The Province is in the process of ranking GBPUs for management using NatureServe's ranking methodology[10]. The NatureServe ranking methods consider current population size, population trend over the past 40 years (approximately 3 generations) and the degree of population isolation. In addition, a threat assessment, which considers future development, is conducted for each GBPU. The threat assessment interprets Provincial current condition assessment indicators, including;

- Amount of habitat loss, alteration and alienation – core security and front country.
- Traffic collisions and displacement – road density
- Hunting and other mortality – mortality
- Food availability – changes in quality food, increase in mid seral due to increases in disturbance and shifts in plant communities triggered by climate change.

The ranking of the northern portion of the Province has been completed and a summary of the criteria and ranks for the GBPUs intersecting the PG TSA is shown in Figure 1. The rankings cover a spectrum of management concern labeled from most (M1), due to declining population, isolation or threats, to least (M5) management concern, no concerns due to stable or increasing population and limited threats. The NatureServe based ranking identifies the Blackwater-West Chilcotin and Nulki GBPUs as M1, Francois as M1-M2 and the Nation as M3, of intermediate management concern. The ranking for the GBPUs that intersect the PG TSA is presented on the map in Figure 1.

Nulki GBPU

The Nulki is classified as M1, of most management concern, under the NatureServe ranking. The Nulki GBPU has been closed to grizzly bear hunting for at least 25 years, as the population has been in decline likely due to relatively high grizzly bear mortality due to human-bear conflicts. Concerns exist over the viability of this grizzly bear population because of the intensity of the human footprint within the Nulki (largely agriculture, human settlement and off-highway roads). In addition, there are concerns over population linkage in the Nulki GBPU, as the southern boundary is adjacent to other M1 ranked GBPUs outside of the PG TSA. Furthermore, linkage to the northern Nation GBPU is suspected to be low because of the low grizzly bear densities in the southern Nation area.

Francois GBPU

The Francois is classified as M1-M2 under the NatureServe ranking. The GBPU has been closed to hunting since 2010 due to an apparent prior overage in the allowable annual human-caused mortality limit, a reduced (modelled) population estimate in 2011 and the fact that no female harvest has occurred since 1999; these all lead to the closure of the licensed harvest. Human-bear conflicts continue to be reported to Conservation Officers (e.g., a sow with 2 cubs at a local abattoir in 2013 near Bickle Lake), but the management estimates of unreported human caused mortality are likely underestimated. Confounding

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[10] Faber-Langendoen, D., J. Nichols, L. Master, K. Snow, A. Tomaino, R. Bi man, G. Hammerson, B. Heidel, L. Ramsay, A. Teucher, and B. Young. 2012. NatureServe Conserva on Status Assessments: Methodology for Assigning Ranks. NatureServe, Arlington, VA.

the situation is the lack of a local grizzly bear population inventory or monitoring. The model-based estimate of 58 bears has been accepted by the Province, but is below historic habitat-based estimates and local anecdotal information.

Nation GBPU

The Nation GBPU ranks in the middle of the NatureServe scale (M3) and is therefore a management concern. The Nation GBPU is open to resident and non-resident grizzly bear hunting. Resident hunter effort is spatially separated into 3 LEH zones within WMU 7-16. Grizzly bear hunting allocation is low in the Nation GBPU because grizzly bear density estimates and allowable human caused mortality rates are low. Movement of grizzly bear from the south into the GBPU is expected to be low as the Nulki GBPU has very low grizzly bear densities. Proximity to human activities (communities, highways) increase probability of non-hunt grizzly bear mortalities

Omineca GBPU

The Omineca GBPU is bounded on the east by the Williston Reservoir. The southern boundary follows the southern limits of the Parsnip Arm and Nation River watersheds. While bears are capable of swimming across the main body of the Williston Reservoir, movement through the eastern boundary of the Omineca GBPU has been affected by the reservoir. This has resulted in the unit being identified as somewhat isolated and having a NatureServe rank of M4-M5.

Table 3. Summary of current GBPU ranking and the criteria for the draft revised ranking for the main PG TSA GBPUs.

GBPU	Nulki	Nation	Black-water-West Chilcotin	Omineca	Parsnip	Robson	Upper Skeena Nass	Francois
current rank	Viable	Viable	Threatened	Viable	Viable	Viable	Viable	Viable
draft revised rank	M1	M3	M1	M45	M5	M5	M5	M12
current population	44	170	53	402	455	534	755	58
population trend	decline	stable	decline	stable	stable	stable	stable	decline
Isolate	C	C	C	D	C	D	D	B
Residential & Commercial Development (habitat loss and alienation)	Yes	Yes	Yes	No	No	Yes	No	No
Agriculture (habitat loss and alienation)	Yes	Yes	Yes	No	No	Yes	No	No
Energy & mining (habitat loss and alienation)	No	No	No	No	No	No	No	Yes
Transportation & Corridors (collisions & displacement)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Biological Resource Use (Hunting & other mortality)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Human Intrusion & Disturbance (human recreation activities)	No	No	No	No	No	No	No	Yes
Natural System Modifications (Fire & Fire Suppresion)	No	No	No	No	No	No	No	Yes
Climate Change (impacts on habitat and food availability)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Figure 1. Grizzly Bear Population Units (outlined in blue) that intersect the Prince George Timber Supply Area and that were considered in the assessment, and their status.
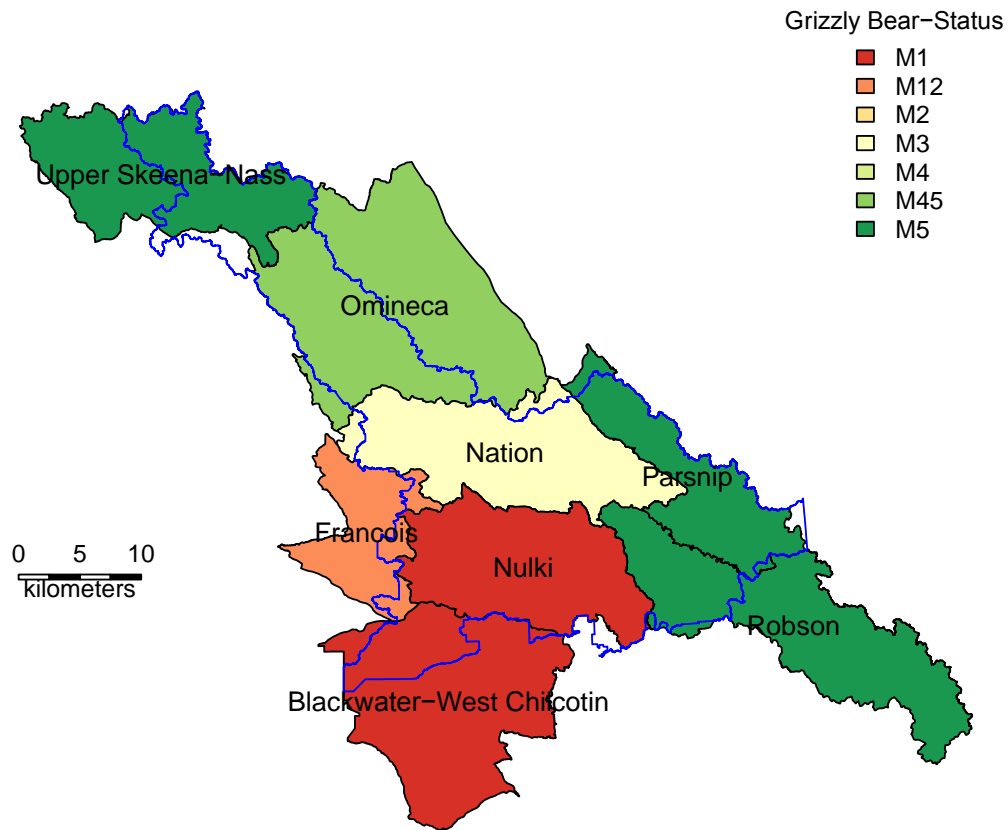
Key Timber Supply Analysis Grizzly Bear Indicators

The Provincial current condition indicators and NatureServe ranking indicators both enable a range of resource management decisions. Some of these indicators are particularly useful for supporting timber supply management decisions, specifically those indicators related to forest harvesting activities. The most relevant indicators for timber supply are road density and mid seral forest condition. The following sections present more detailed information on these indicators for each GBPU in the PG TSA.

Mortality Risk Factor: Road Density

Open road densities above 0.75 km/km^2 have been correlated with decreased survival rates in an Alberta grizzly bear population[11]. Similarly, a BC/US grizzly bear sub-population was found to be increasing in areas where road density averaged 0.39 km/km^2 and decreasing where density averaged 0.9 km/km^2 [12]. Several studies have recommended thresholds of 0.6 km/km^2, and planning processes in BC, Alberta and the US have used these recommendations[13]. Figure 2 presents a map of current road density (km/km^2) classes for LUs within GBPUs that intersect the TSA. A statistical summary of the road density of each LU within the GBPUs is shown in Figure 3.

Habitat Risk Factor: Mid Seral Forest

The current condition of mid seral forest of LUs within the GBPUS that intersect the PG TSA is presented in Figure 4. Mid seral condition can be tracked when projecting future forest structure and limits to long-term grizzly bear forage supply can be assessed.

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[11] Boulanger and Stenhouse 2014

[12] MacHutchon and Proctor 2015

[13] Mace et al. 1996; Noss RF, Quigley HB, Hornocker MG, Merrill T, Paquet PC. 1996. Conservation biology and carnivore conservation in the Rocky Mountains. Conservation Biology 10:949-963; Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. McLellan BN, Hovey FW. 2001. Habitats selected by grizzly bears in a multiple use landscape. Journal of Wildlife Mangement 65:92-99. BC Ministry of Ministry of Environment, Lands and Parks 2000. Environmental trends in BC 2000. State of Environment Reporting. Accessed April 30, 2014: http://www.env.gov.bc.ca/soe/archive/reports/93_98_00/enviro-trends2000.pdf; Antoniuk T, Ainslie B. 2003. CEAMF Study Volume 2: cumulative effects indicators, thresholds, and CEAMF, edited by Salmo Consulting Inc. and Diversified Environmental Services: Prepared for the BC Oil and Gas Commission. Muskwa-Kechika Advisory Board.

Figure 2. Map showing road density classes for the LUs within GBPUS that intersect the PG TSA.
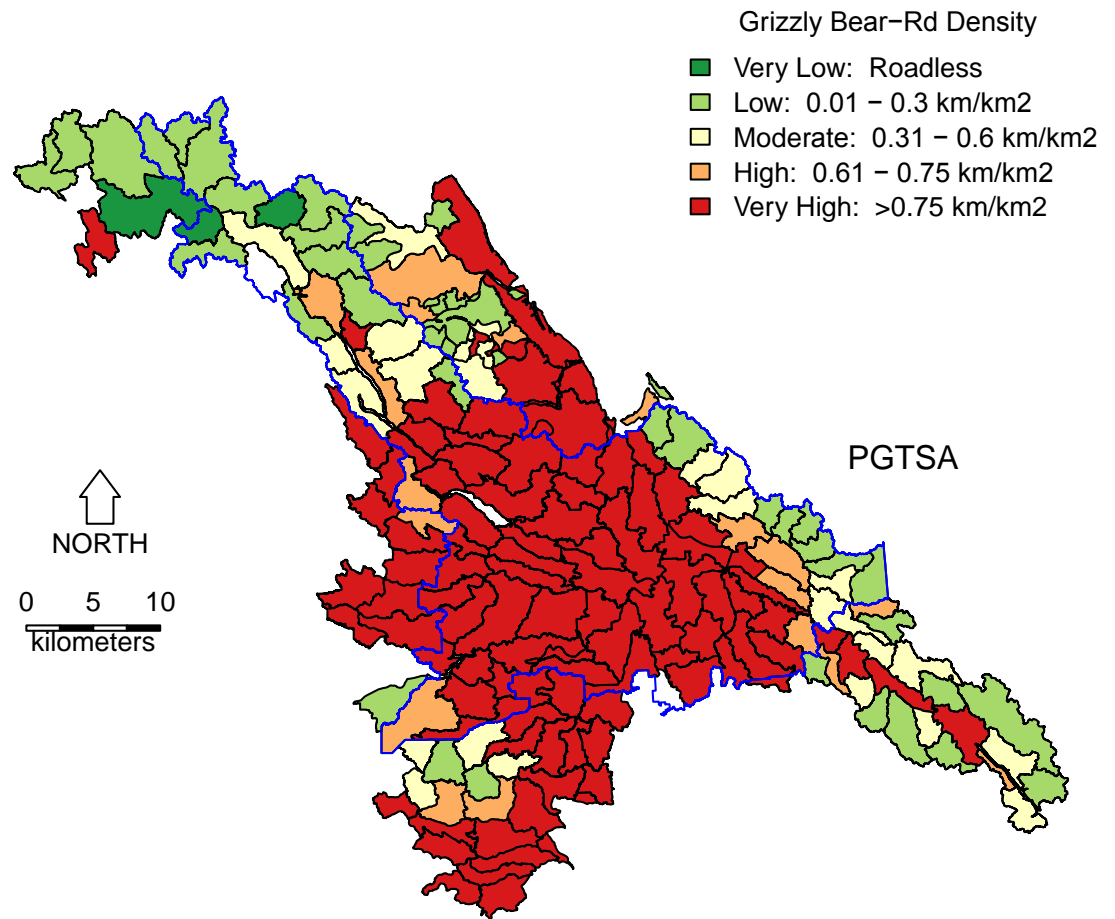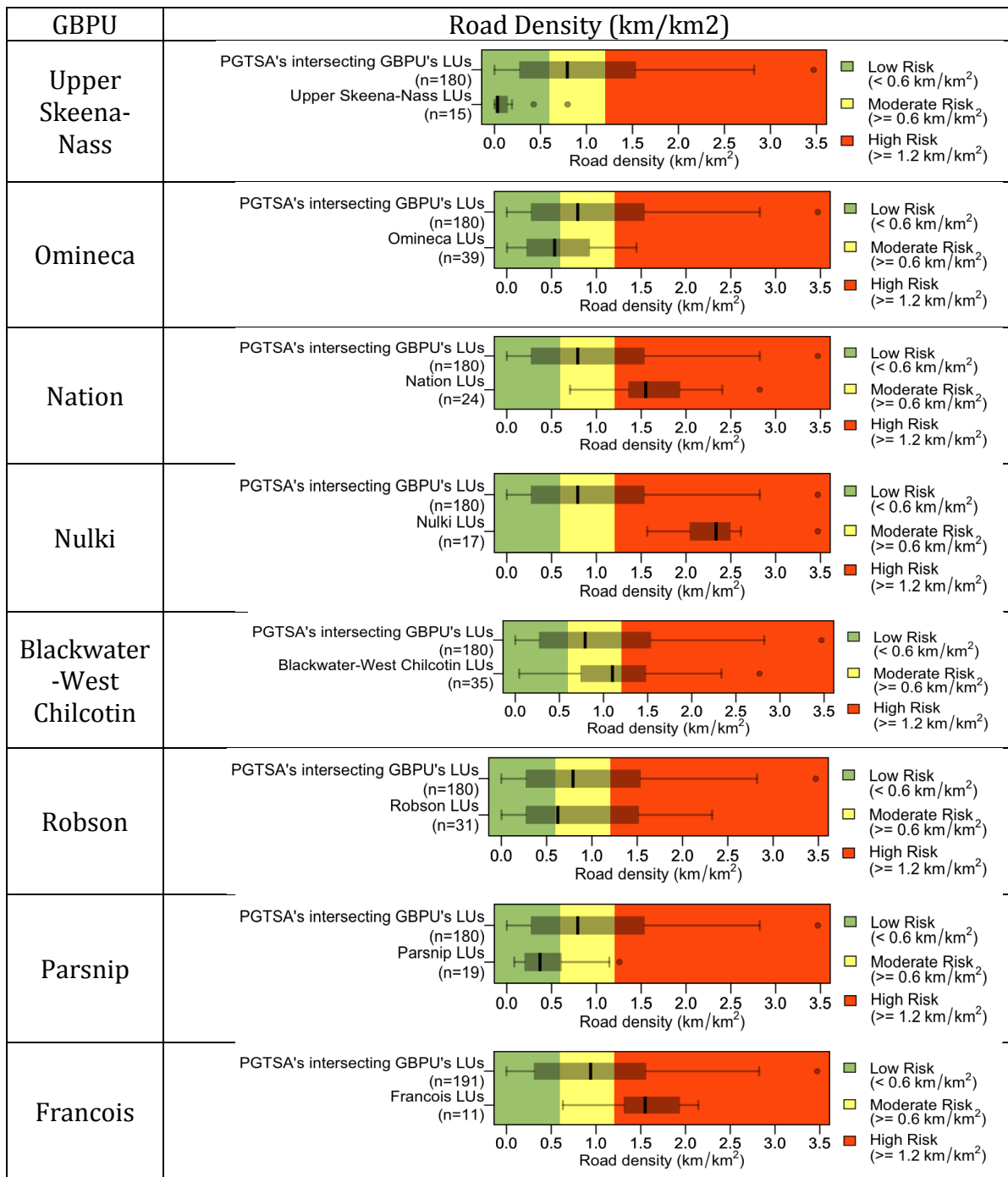
Figure 3. Box plot of road density (km/km^2) measured in landscape units (LUs) within grizzly bear population units (GBPUs) that intersect the Prince George timber supply area (TSA) compared with road density measures across all the LUs and low (green), moderate (yellow) and high (orange) risk benchmarks[14].

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[14] Box plot description: Dark bar is median value, shaded area defines the 2nd and 3rd quartile. Maximum and minimum values are the end of the lines, excluding outliers. Outliers are <Q1 – 1.5*Inter Quartile Range and >Q3 + 1.5* Inter Quartile Range.

Figure 4. Map showing landscape units (LUs) that fail to have more than 30% mid-seral conifer for the grizzly bear population units (GBPUs) that intersect the PG TSA.
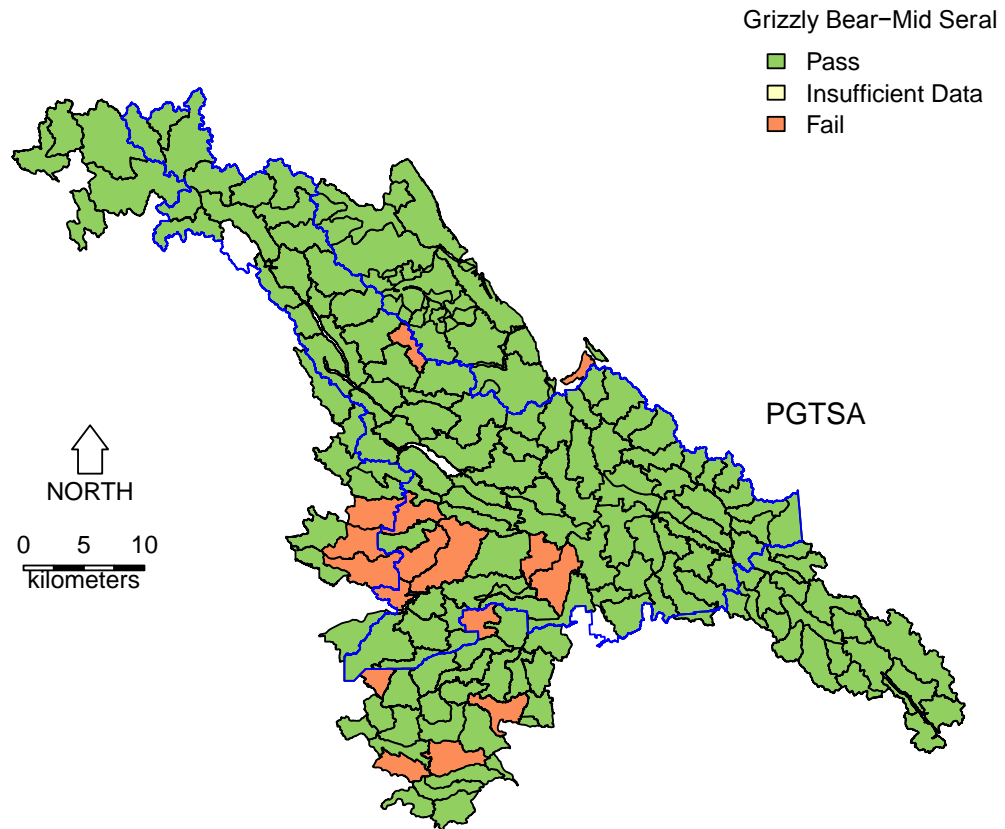
Selecting Landscape Units for Applying Enhanced Grizzly Bear Conservation Constraints

Grizzly bears have been identified in the PG TSR process as a species for special consideration in the analysis. This selection is based on a number of factors, including:

- Grizzly bears are listed Federally as a "species of special concern" and Provincially, under the Identified Wildlife Management Strategy (IWMS) as a "species at risk".
- Grizzly bears were identified in Regional LRMPs. However, there are no legal requirements within the management areas.
- They are a priority management species for First Nations in the region. Efforts are needed to meet legal obligations, primarily as established in the BC Supreme Court decision in the *Tsilhqot'in* case, to consider First Nations rights to harvest wildlife using credible information as part land use decisions.

Two factors are highlighted for inclusion into the TSR analysis: constraining road density and mid-seral forest condition at the LU scale. Road density was constrained to a maximum of 0.6 km/km^2 and the amount of mid-seral conifer was constrained to a maximum of 30%. Given the challenge of recovering highly developed landscapes and the impact on timber supply of applying these constraints universally, an analysis was conducted to identify the best candidate LUs for applying these constraints. The results of the application of the constraints on timber supply will be presented in a subsequent report.

The criteria for selecting priority LUs where road density and mid seral constraints will be applied were as follows:

- High (class 1 and 2) food value based on Broad Ecosystem Inventory (BEI) classification[15] occurs in greater than 50% of habitat in the LU
    - 24 LUs identified; included the majority of white bark stands in the region.
- Salmon –biomass greater than 10,000kg (based on all species of salmon escapement summed to LU)
    - 13 additional LUs identified.
- Removed all LUs with greater than 60% high-food value habitat protected under the assumption that there was already mitigation in place for grizzly bears
    - 4 LUs dropped, 33 remaining.

The map, Figure 5, and accompanying list of LUs, Table 4, present the LUs selected for applying mid seral and road density constraints.

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[15] **Ministry of Environment**, Broad Ecosystem Inventory Home. Accessed (2015): http://www.env.gov.bc.ca/ecology/bei/

Figure 5. Priority landscape units (LUs; n = 33) in the PG TSA based on either forage or salmon, and conservation protection.
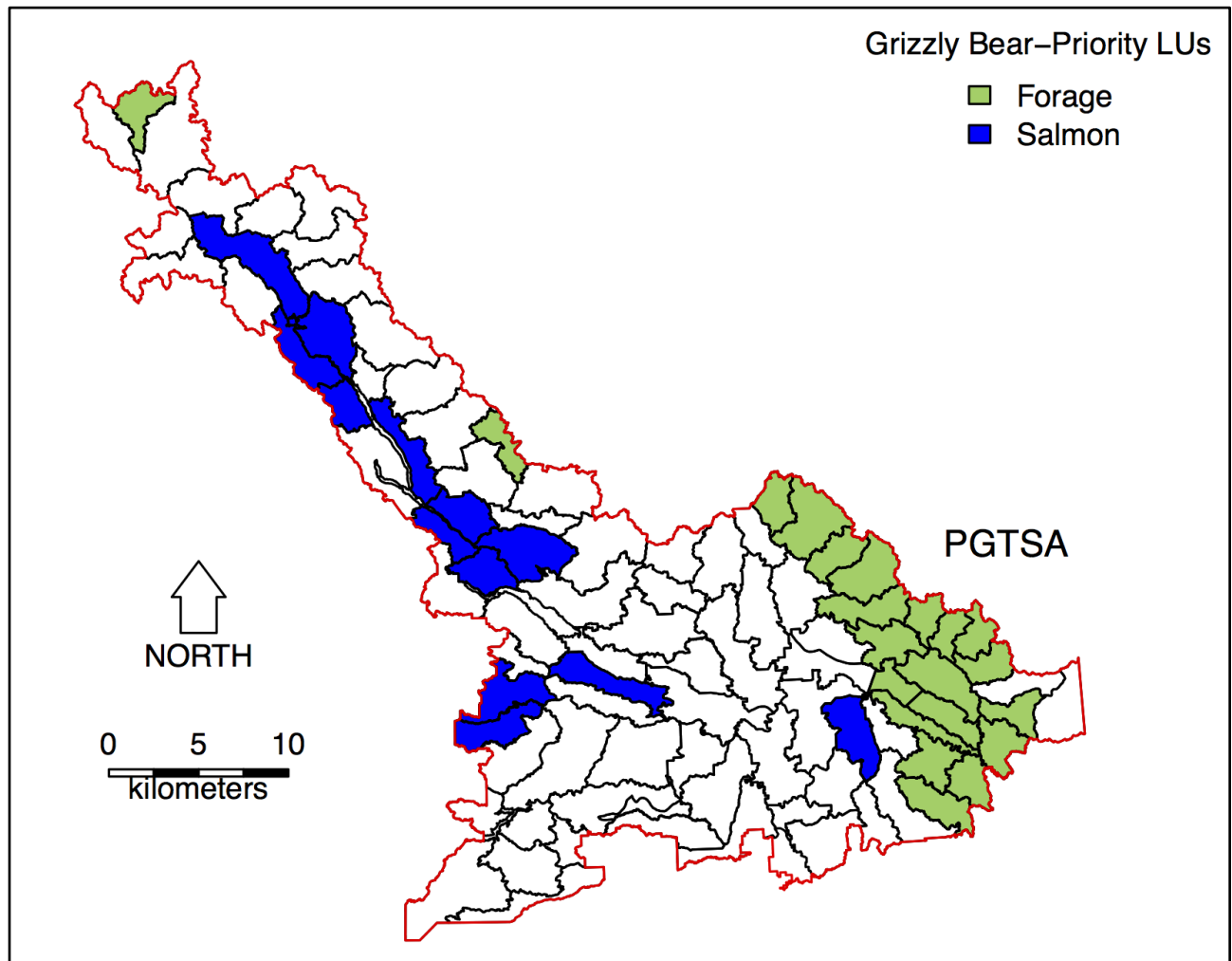
Table 4. Priority landscape units (LUs) selected based on potential forage supply and salmon protein.

LandscapeUnit	Food	Forage_%	Salmon_kg
Anzac	Forage	70.25	0
Captain	Forage	55.74	4,417
Dome	Forage	81.88	1,083
Driftwood	Salmon	29.50	32,105
Endako	Salmon	3.74	41,465
Fontinako	Forage	67.87	4,232
Framstead	Forage	80.98	0
Fraser	Forage	56.30	0
Frypan	Salmon	17.08	17,629
Gleason	Forage	75.66	0
Grostete	Salmon	4.68	136,668
Haggen	Forage	79.64	1,757
Humbug	Forage	78.20	3,477
Kitchi	Forage	70.98	0
Klawli	Forage	65.84	0
Kluatantan	Forage	51.72	0
Lion	Salmon	36.69	25,388
Middle	Salmon	5.87	133,966
Missinka	Forage	68.41	0
Nithi	Salmon	0.40	210,263
Ovington	Forage	62.18	0
Parsnip	Forage	52.49	0
Purden	Salmon	13.81	11,493
Reynolds	Forage	61.95	0
Slim	Forage & Salmon	77.79	15,778
Spakwaniko	Forage	72.72	788
Stuart	Salmon	1.89	11,494
Sustut	Salmon	34.16	46,231
Table	Forage	76.58	0
Takla	Salmon	28.29	17,470
TFL42	Salmon	4.40	87,365
Torpy	Forage	76.17	7,595
Woodall	Forage	58.65	1,176

Appendix 1. Provincial Grizzly Bear Assessment indicator summary

Component	Data Inputs	Indicator	Metric (by strata)	Supplemental Flags by LU	Core Indicator Flags by LU	Overall Rollup by LU

- GBPU Status → Population Status → Provincial Status (GBPU) → Population Threatened

- Compulsory Inspection (bears only) → Grizzly Bear Mortality Rate → Hunting Mortality vs. Allocation (GBPU/MU/LEH/Park) → Mortality Limit Exceeded in any of last 3 time periods (in allowable hunting areas)

- Bear Population Estimates → Number of Bears → Density Estimates #/1000km2 (GBPU/MU/LEH/Park) → <10/1000km2

Population

- Roads/Utilities → Road Density → km/km2 (LU) → > 0.6 km/km2 / > 0.75 km/km2

- Roads/Utilities
- Road Density Raster
- Disturbance
- BEI
→ Core Security → Capable Secure Core >= 10km2 (30x30m raster) → Core Security <60% Core

- Roads
- Cities/Human Population
- Land Type / Use
→ Front Country / Human Encounter → Travel Time from Settlements or High Use Roads (1 ha raster) → Lethal Encounter Index: >20% Front Country and High Hunter Density → Lethal Encounter with Food Index: >20% Front Country and High Hunter Density and Quality Food → >20%Front Country

- Resident Hunter Questionnaires
- Guide Outfitter Declarations
→ Hunter Day Density → Average Annual Hunter Days (MU) → Hunter Day Density > 1.5 days/km2 (top quartile)

- BEI
- Salmon Escapement
→ Quality Food → Capable BEI + kg Salmon (LU) → High Salmon or High/VHigh Capable

Habitat

- BEC
- VRI
- Consolidated Cutblocks
→ Mid-Seral Dense Conifer → Provincial Forest Age/Basal Area/ Crown Closure/Sp BEC Zone km2 (polygon) → >30% Mid-Seral Dense Conifer in select BEC Zones

- BEI
- Protected/Restricted Areas
→ Habitat Protection → High/VHigh Capable and Protected/Restricted km2 (polygon) → >30% Protected/Restricted / >60% Protected/Restricted

- WHA & Specified Areas
- Coastal EBM areas
→ WHA or EBM Legal Order → WHA or EBM designation km2 (polygon) → WHA or EBM present/absent

LU is flagged if:

- Population is Threatened or
- Mortality Rate is Exceeded or
- Capable Secure Core < 60% or
- Front Country > 20% or
- Hunter Day Density >1.5 or
- BEC Mid-Seral Dense Conifer >30%.

A maximum of six flags are counted.

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Appendix 2. GBPU Scale Mortality Summary for 3 past Grizzly Bear Allocation Periods.

Table 5. Estimated population size, average number of bears reported killed per year and the percent of the population killed by allocation period and Grizzly Bear Population Unit.

Allocation Period	Nulki	Nation	Black-water-West Chilcotin	Omineca	Parsnip	Robson	Upper Skeena-Nass	Francois
2004-2006								
# of Bears	192	484	193	726	473	689	661	192
Avg Mortality	1.33	5	4	13.33	12	20	8.33	0
% Mortality	0.69%	1.03%	2.07%	1.84%	2.54%	2.90%	1.26%	0.00%
2007-2011								
# of Bears	192	241	193	481	473	631	661	140
Avg Mortality	3.8	4.6	1.4	13.8	11.8	18	13.4	1
% Mortality	1.98%	1.91%	0.73%	2.87%	2.49%	2.85%	2.03%	0.71%
2012-2015								
# of Bears	44	170	53	402	455	534	755	58
Avg Mortality	1.25	3.25	1	11	10.25	13	7.75	0.25
% Mortality	2.84%	1.91%	1.89%	2.74%	2.25%	2.43%	1.03%	0.43%