

British Columbia Grizzly Bear Population Estimate for 2018

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Introduction

This report summarizes the Grizzly bear population estimate for British Columbia (BC) as of 2018. The previous population estimate was made in 2012, and before that an estimate was made in 2004 (Hamilton et al. 2004) and updated in 2008 (Hamilton 2008). The 2018 population estimate is primarily derived from a predictive population density model. This model uses Grizzly bear inventories done across North America, to predict density based on several environmental and human use factors thought to influence bear numbers. Where they existed, field inventory results were used to generate a population estimate for the area surveyed and were extrapolated to a reasonable area beyond the survey area. Expert knowledge of local areas was used to evaluate model estimates and to adjust population estimates for Grizzly Bear Population Units (GBPUs) where the model output did not align with local knowledge.

The population estimate was updated to support the provincial cumulative effects analysis process. The only changes from the 2012 report are revisions to the estimates for 8 population units where we have recent field-based inventory information [Garibaldi-Pitt, South Chilcotin Ranges, Squamish-Lillooet, Stein-Nahatlatch, Toba-Bute (Apps et al. 2014); Flathead, South Rockies (Mowat and Lamb 2016); and Kettle-Granby (Mowat et al. 2017)].

In areas where they were hunted, Grizzly bear populations generally increased from the early 1980s until the mid 2000s (Hatter et al. 2018, McLellan et al. 2018) and then declined in some areas in southeast BC (McLellan 2012, Lamb et al. 2016). The decline seems to have abated in the past 3 to 4 years (G. Mowat, unpublished data). The isolated population in the Stein-Nahatlatch unit has declined since monitoring began in 2005 (McLellan et al. 2019), and the number of grizzly bears in the North Cascades area in BC and Washington State is very low with no evidence for an increase over the past many decades.

Grizzly Bear Population Units

The current range of Grizzly bears in British Columbia is divided into 55 GBPUs that delineate individual bear populations for conservation and management. In southern British Columbia, GBPU boundaries follow natural (e.g. large rivers) and human-caused (e.g. settled valleys) fractures in Grizzly bear distribution. In the case of many southern GBPUs, the boundaries also reflect a degree of genetic isolation from other populations (Proctor et al. 2012). In northern and coastal British Columbia, GBPU boundaries follow natural and ecological boundaries or

transition areas (primarily heights of land between watersheds) as there are few actual barriers to Grizzly bear movement. GBPU are best thought of as management units not distinct or independent grizzly bear populations.

In 2015, boundary adjustments to a few GBPU resulted in adjustments to the population estimates for those units. For example, merging the Spillamacheen GBPU with the North Purcells GBPU added 98 bears to the population estimate of the North Purcells unit (the estimate for the former Spillamacheen unit). Other smaller boundary changes were also done at this time, and population estimates were adjusted based on the area that was moved to the adjacent GBPU.

GBPU boundaries at the edges of Grizzly bear distribution in the province represent the “occupied/unoccupied” line. This line was drawn to reflect the known or predicted distribution of resident adult females. Transient males, particularly subadults, are occasionally sighted in unoccupied areas. These boundaries will be updated if the grizzly bear distribution changes. GBPU serve as the key units for setting population objectives, and they are also used for setting land-use priorities during strategic land-use planning. Each GBPU has been assigned one of five conservation classes (based on population isolation, population size, and cumulative threats) to aid in conservation planning: M1 = Extreme Concern, M2 = High Concern, M3 = Moderate Concern, M4 = Low Concern, and M5 = Very Low Concern (Table 1; Morgan et al. 2019). In the future, population objectives will be set for all GBPU in BC, beginning with those that are most at risk.

Population Estimation

Population estimates for Grizzly bears in BC have changed over the years, as new methods for estimating populations have become available. In the 1970s, the estimate was 6,600 bears. That changed to 13,000 (a minimum estimate) in 1990, and then increased again to 17,000 in 2004. The estimate for 2008 was 16,000, and this was revised to 15,000 in 2012. Because the methods used to estimate the population have evolved and improved over time, the variation in estimates from year to year do not reflect a trend in Grizzly bear numbers in the province. The current estimate was generated using all available inventories and the most rigorous statistical modelling approach employed to date.

Direct inventories used DNA mark-recapture methods to determine bear density (the number of bears per 1000 km²) in a particular area. This type of inventory, that was first developed in British Columbia (Woods et al. 1999), has been carried out here since 1996, and it provides the most reliable population estimates which include a measure of confidence (see summary in Proctor et al. 2010). Direct application of inventory data was used to derive the 2018 population estimate for many units across BC.

In most of the province, a model was used to estimate the number of Grizzly bears in a

population unit (Mowat et al. 2013). The interior model used 89 estimates of Grizzly bear density from study areas across the interior of western North America. It predicted Grizzly bear density using variables such as precipitation, vegetation type, and human and livestock density. Hunting (harvest/1000 km²) was not a significant factor predicting density. The above model was derived for areas where grizzly bears ate little or no salmon (i.e. the province's interior), and a second model was built to predict density for coastal areas where salmon was a large part of the diet. The coastal model had 18 records of density and included 4 variables. A simpler model was used to obtain the 2008 Grizzly bear population estimate (Mowat et al. 2004); however, the current models incorporate additional data from recent inventories and use more sophisticated statistical analysis. The new models were also applied at the finer scale of Wildlife Management Units (WMUs) to better reflect density differences within GBPUs (most GBPUs incorporate several WMUs).

Model estimates were carefully evaluated by ministry regional biologists. They considered the precision of the model estimate, local knowledge about bear distribution and movements, availability of major food sources such as salmon, as well as the age and sex of past hunter harvests, and the frequency of human-bear conflict occurrences. The model estimate was accepted or modified based on the above considerations. For example, the model for interior areas of the province was better at predicting densities than the model for coastal areas. For some coastal populations, rather than strictly relying on the model, biologists used information from inventories and local knowledge about the abundance of bears to estimate the population.

In some areas, the model estimate was modified to be lower or higher through expert opinion. In 17 of 184 WMUs, the opinion of experts differed greatly from model estimates. In six of these WMUs, the model predicted no bears, but because bears were known to exist in these areas, the model estimate was changed. Of the remaining 11 WMUs, three were adjusted down and eight were adjusted up. In the majority of these cases (9), the WMUs were on the coast or supported abundant spawning salmon. The authors of the model cautioned that the "coastal" version of the model was less reliable than the "interior" version, largely because of the limited number of reliable density estimates available for the coast, and the high influence of rainfall as a model input parameter. In the final two WMUs, regional biologists applied densities from adjacent WMUs and inventories that were done in similar ecosystems.

The revised Grizzly bear population estimate for British Columbia in 2018 is 14,925 bears. A quantitative measure of precision at the provincial level is not possible because the expert-based approach does not provide a statistical estimate of uncertainty.

The 2018 estimate of approximately 15,000 bears should not be interpreted as a decline in Grizzly bear numbers since 2008, but rather a more accurate estimate of the total population size in the province. Differences between the 2008, 2012, and 2018 estimates are due to the updated

model, the application of the model at the Wildlife Management Unit scale, and the availability of new information, such as recent inventory and monitoring work which informed the revised estimates. Population estimates by GBPU are summarized in Table 1. Grizzly bear densities by GBPU, in increments of 10 bears/1000 km², are shown in Figure 1.

Grizzly Bear Hunting

Licensed grizzly bear hunting was closed in British Columbia beginning with the 2018 spring hunt. Data from hunter killed bears were used to estimate broad scale population trend (Hatter et al. 2018), evaluate the sustainability of hunter harvest (Artelle et al. 2013, Lamb et al. 2016, McLellan et al. 2016), and investigate the level of unreported mortality (Lamb et al. 2016, McLellan et al. 2018). All grizzly bears killed by people in BC, not just those killed through hunting, must be submitted to a government representative for inspection. These data can be used to calculate the level of grizzly bear mortality and identify areas to focus conflict reduction efforts; however, many bears that are killed are not reported.

Figure 1. Grizzly bear density by Grizzly Bear Population Unit for the occupied areas of British Columbia in 2018.

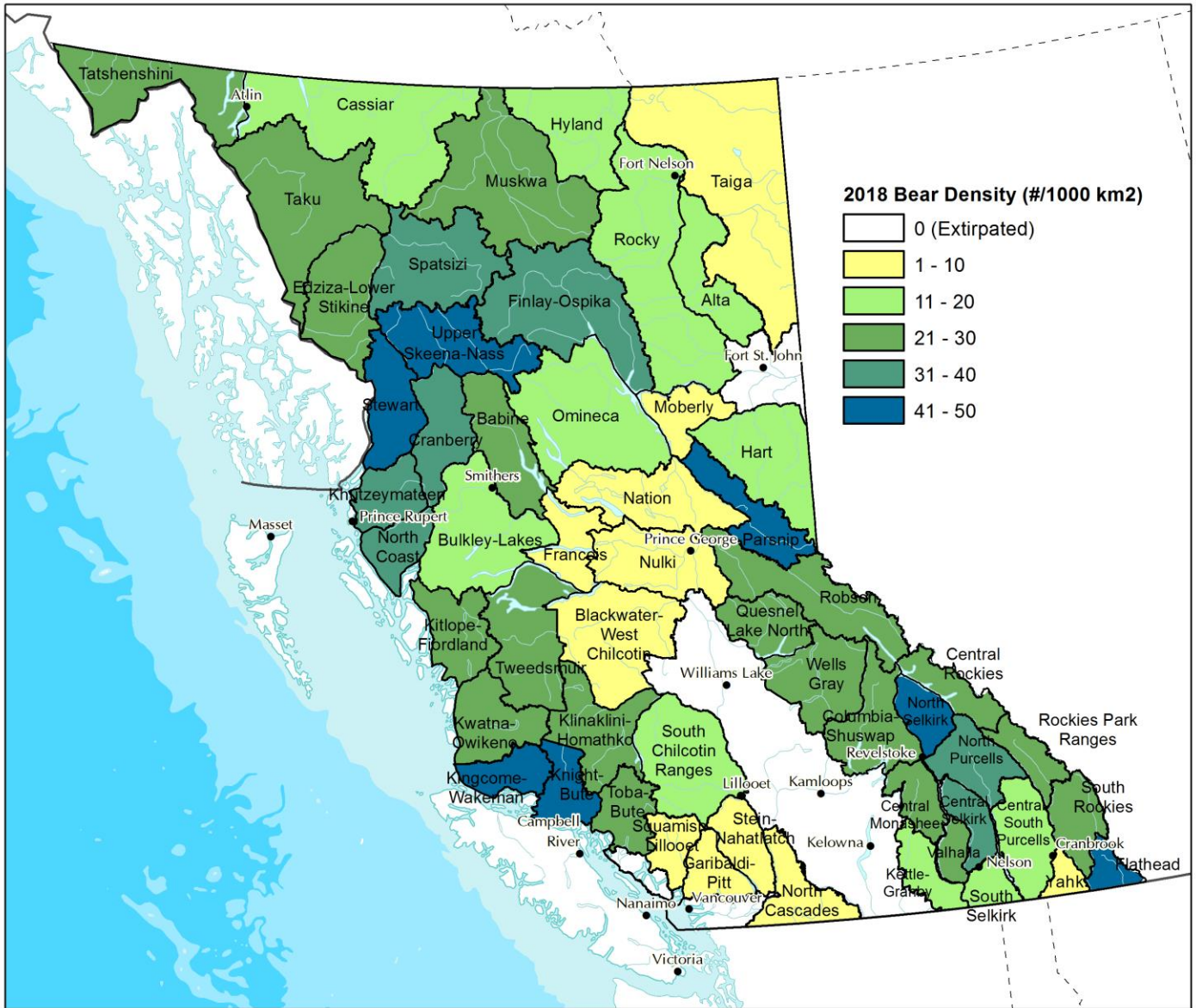


Table 1. Grizzly bear population estimates for British Columbia by GBPU in 2018. Density is given as bears/1000 km². Conservation concern is highlighted with red being greatest concern grading to dark green being least concern.

GBPU Name	2018 Population Estimate	2018 Estimated Bear Density	2018 Conservation Concern Rank
Alta	132	10.0	M3: Moderate
Babine	313	22.8	M3: Moderate
Blackwater-West Chilcotin	53	2.4	M3: Moderate
Bulkley-Lakes	439	19.7	M3: Moderate
Cassiar	611	17.1	M5: Very Low
Central Monashee	147	23.5	M2: High
Central Rockies	169	27.9	M4: Low
Central Selkirk	188	34.5	M3: Moderate
Central-South Purcells	176	15.8	M2: High
Columbia-Shuswap	318	25.2	M2: High
Cranberry	352	30.7	M4: Low
Edziza-Lower Stikine	398	29.4	M5: Very Low
Finlay-Ospika	971	32.5	M5: Very Low
Flathead	140	40.2	M2: High
Francois	58	7.5	M2: High
Garibaldi-Pitt	3	0.5	M1: Extreme
Hart	244	12.5	M3: Moderate
Hyland	231	13.4	M5: Very Low
Kettle-Granby	87	13.3	M2: High
Khutzeymateen	277	38.4	M4: Low
Kingcome-Wakeman	199	41.0	M4: Low
Kitlope-Fiordland	214	23.1	M4: Low
Klinaklini-Homathko	251	20.3	M4: Low
Knight-Bute	250	46.6	M4: Low
Kwatna-Owikeno	229	24.8	M4: Low
Moberly	71	9.4	M2: High
Muskwa	840	23.9	M5: Very Low
Nation	170	9.7	M3: Moderate
North Cascades	6	0.6	M1: Extreme
North Coast	190	30.4	M3: Moderate
North Purcells	332	38.6	M3: Moderate
North Selkirk	265	48.9	M3: Moderate
Nulki	44	2.7	M2: High
Omineca	402	14.0	M5: Very Low
Parsnip	455	42.6	M5: Very Low
Quesnel Lake North	187	21.5	M3: Moderate
Robson	534	28.4	M3: Moderate
Rockies Park Ranges	116	20.2	M2: High
Rocky	538	14.3	M3: Moderate
South Chilcotin Ranges	222	11.7	M3: Moderate
South Rockies	170	21.2	M2: High
South Selkirk	58	14.3	M2: High
Spatsizi	666	31.9	M5: Very Low
Squamish-Lillooet	46	9.3	M2: High
Stein-Nahatlatch	22	2.9	M1: Extreme
Stewart	358	40.3	M5: Very Low
Taiga	94	1.9	M4: Low
Taku	576	20.8	M5: Very Low
Tatshenshini	407	28.1	M4: Low
Toba-Bute	130	20.9	M4: Low
Tweedsmuir	368	22.1	M5: Very Low
Upper Skeena-Nass	755	46.9	M5: Very Low
Valhalla	88	25.5	M2: High
Wells Gray	345	24.8	M4: Low
Yahk	20	7.4	M2: High

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