

DRAFT

British Columbia Grizzly Bear (*Ursus Arctos*) Stewardship Framework



DRAFT

Prepared for the Ministry of Forests



Publication Date (TBD)

ABOUT THE BRITISH COLUMBIA GRIZZLY BEAR (URSUS ARCTOS) STEWARDSHIP FRAMEWORK

British Columbia is home to some of North America's last remaining places where large predators and their prey play out their millennia-old roles. Grizzly bears are a key part of these systems. Indigenous peoples have acted as stewards and have co-existed on the land with grizzly bears since time immemorial, in effect stewarding populations and conserving habitat. The goal of the provincial government is sustainable and healthy populations of grizzly bears and a great deal of effort and research is invested in the stewardship of these populations and conserving their habitat.

The name "grizzly bear" elicits profound emotions from people around the world. The species is often paired with terms like "iconic", "apex predator", "umbrella species", "teacher", "powerful", and "ancestor". In British Columbia, the range and diversity of interests, values, cultural and social importance, economic opportunities, and tolerance towards grizzly bears is as varied as the people who live here. This framework focuses on, and intends to provide, structure and guidance for discussion and action to the people and governments in the Province of British Columbia to steward and co-exist with grizzly bears.

The framework was prepared in response to the recommendations from a Scientific Review of Grizzly Bear Harvest Management in 2015 and from the Auditor General of British Columbia in 2017, because grizzly bears in western Canada are designated federally as a species of special concern, and due to their significance to the people of the province.

This framework does not seek to provide specific recommendations for site specific grizzly bear challenges. At nearly 950,000 km² (larger than the states of Washington, Oregon, and California combined), the province is too large, and the challenges and opportunities related to grizzly bear stewardship too diverse, for the framework to discuss site-specific concerns. This framework summarizes the best available information on cumulative knowledge (Indigenous and scientific), biology and threats, and endeavours to provide broad advice for grizzly bear stewardship at the provincial, First Nations territorial, regional, and local levels. This framework is intended to provide guidance for the consideration of grizzly bear values for proponents, decision makers, and participants on initiatives related to land and resource planning to inform local decisions, and enables amendments to policy, legislation, and programs related to grizzly bears.

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the advice set out in this stewardship framework through the co-development of action or implementation plans at the appropriate spatial scale. Within those complementary plans, it is expected that the specific management and stewardship actions will be prioritized and resourced in accordance with the opportunities and constraints of participatory agencies and organizations that hold the shared interest and responsibility to achieve the desired outcomes.

WHO IS THIS STEWARDSHIP FRAMEWORK FOR?

This framework provides valuable information on grizzly bear stewardship that may be used by individuals, communities, governments, land users, resource extraction industries, conservationists, academics, and natural resource and stewardship professionals interested in the stewardship of grizzly bears and their habitats.

FOR MORE INFORMATION

To learn more about species at risk recovery planning in British Columbia, please visit the B.C. Recovery Planning webpage¹.

RECOMMENDED CITATION

B.C. Ministry of Forests. (YEAR TBD). British Columbia Grizzly Bear (*Ursus Arctos*) Stewardship Framework. B.C. Ministry of Forests, Victoria, BC.

COVER PHOTOGRAPH

Michelle McLellan

ADDITIONAL COPIES

Additional copies can be downloaded from the [B.C. Recovery Planning webpage](#).

¹ www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk/recovery-planning

ACKNOWLEDGEMENTS

This draft stewardship framework was led by the BC Grizzly Bear Stewardship Team and funding was provided by the B.C. Ministry of Forests. Ramona Maraj provided significant input early in the process. Other authors included Bruce McLellan, Stephen MacIver and Garth Mowat and many members of the Grizzly Bear Stewardship Team provided input and review.

A special thanks goes out to the delegates, stewardship staff, advisors, knowledge holders, and in some cases the hereditary chiefs and councillors from the Indigenous Nation governments and groups listed below that provided feedback, advice, and input into the development of this framework; their contribution has led to a significantly improved framework. These Nations and others may choose to be directly involved in the implementation of the goals of this framework.

In alphabetical order:

- *Blueberry River First Nation*
- *Carrier Sekani Tribal Council: Ts'il Kaz Koh First Nation (Burns Lake), Nadleh Whut'en, Saik'uz First Nation, Stelat'en First Nation, Takla Lake First Nation, Tl'azt'en Nation, Wet'suwet'en First Nation*
- *Stewardship staff and advisors with the Coastal First Nation – Great Bear Initiative Nations*
- *Da'naxda'xw/Awaetlala First Nation*
- *Doig River First Nation*
- *Esk'etemc Nation & Northern Shuswap Tribal Council: 4 Northern Secwepemc te Qelmucw (NStQ) communities: Tsq'ēseñ (Canim Lake), Stswēceṁc/Xgāt'tem (Canoe-Dog Creek), Xatsūll Cmetem' (Soda-Deep Creek), T'ēxelc (Williams Lake a.k.a. Sugar Cane)*
- *Gitanyow Hereditary Chiefs' Office*
- *Gitx'san Nation*
- *Gwa'sala-Nakwaxda'xw*
- *Kitsumkalum*
- *Ktunaxa Nation*
- *Kwadacha First Nation*
- *Lake Babine Nation: Fort Babine, Old Fort (Nedo'ats), Tachet, Donald's Landing, Woyenne*
- *Little Shuswap Lake Indian Band*
- *Maa nulth First Nations: Huu-ay-aht First Nations, Ka:'yu:k't'h/Che:k:tles7et'h' First Nation, Uchucklesaht Tribe, Yuuʔuʔiʔath (Ucluelet) First Nation, Toquaht First Nation*
- *McLeod Lake Indian Band*
- *Nisga'a Lisims Government*
- *Nlaka'pamux Nation Tribal Council: Snepa, Nteq'em, Lytton, Skuppah, Boothroyd*
- *Okanagan Nation Alliance: Upper Nicola Band, Okanagan Indian Band, Westbank First Nation, Penticton Indian Band, Osoyoos Indian Band, Lower Similkameen Indian Band, Colville Confederated Tribes*
- *People of the River*

- *Pespesellkwe (Lakes Division of the Secwepemc): Adams Lake Indian Band, Neskonlith Indian Band, Splats'in Indian Band, Little Shuswap Indian Band, Lower Similkameen Indian Band, Shuswap Indian Band*
- *Qwelminté Secwepemc Table: Adams Lake Indian Band, Little Shuswap Lake Indian Band, Shuswap Indian Band, Simpcw, Skeetchestn, Splatsin, Tk'emlups te Secwepemc*
- *Shíshálh / Sechelt Nation*
- *Squamish Nation*
- *Tahltan Nation*
- *Tsay Keh Dene Nation*
- *Tsilhqot'in National Government, Tsi Deldel, Xení Gwet'in*
- *Upper Similkameen*
- *We Wai Kai Nation (Cape Mudge)*
- *Wei Wai Kum (Campbell River)*
- *Williams Lake First Nation*
- *Witset First Nation*

Provincial Government Grizzly Bear Stewardship Team Members:

- Bruce McLellan
- Garth Mowat
- Stephen MacIver
- Shelley Marshall
- Mike Badry
- Jeffrey Shatford
- Francis Iredale
- Sean Pendergast
- Michael Burwash
- Audrey Gagne-Delorme
- Chris Lewis
- Helen Schwantje
- Don Morgan
- Conrad Thiessen
- Karine Pigeon
- Suzanne Harkness

EXECUTIVE SUMMARY

The grizzly bear (*Ursus arctos*) was assessed as a Species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2012 and was subsequently listed as Special Concern in Canada on Schedule 1 of the *Species at Risk Act* (SARA) in 2018. Grizzly bears are habitat generalists and their distribution and abundance are largely driven by habitat productivity and historic and current human-caused mortality patterns. The species is sensitive to human disturbance; in particular, settled valley bottoms and roads travelled by people create direct impacts on bears through human-caused mortality and indirect impacts on bears through displacement from key habitats. The most recent COSEWIC status report for grizzly bears states “the grizzly bear's habitat is at risk from expanding industrial, residential and recreational developments. Habitat and population fragmentation are ongoing in the southern part of the bear's distribution. Due to life history characteristics, the grizzly bear is particularly sensitive to human-caused mortality (including hunting, poaching, accidents and conflict-related kills)”.

The Canadian population is estimated at 26,000 bears and there is evidence of range expansion in the far north and towards the fringes of their distribution in the south and west in coastal B.C. There is no evidence of a decline in the overall population during the past 30 years, though most populations lack adequate abundance data to detect changes in population trend. A few populations towards the southern extent of their range in southern B.C. have declined recently and there are concerns about unsustainable mortality rates in these areas and in parts of the Yukon. There is genetic and demographic fragmentation in the southern parts of their range and some populations are partially or fully isolated. Several of these populations have been recently increasing which should help reduce further fragmentation. Grizzly bears are extirpated from the lower mainland and the most settled parts of the interior plateau of B.C. A few B.C. populations, such as those in the Stein-Nahatlatch, North Cascades and Garibaldi-Pitt areas, remain isolated and are not likely to recover without direct intervention such as physically transplanting animals from other populations into these areas, along with other measures such as habitat improvement, habitat connectivity, and mortality reduction.

The COSEWIC status report stated that “The... increasing pressures of resource extraction and cumulative impacts in currently intact parts of the range heighten concern for this species if such pressures are not successfully reversed.” Species listed under the SARA require provincial and federal governments to develop a plan to minimize the chance that the species becomes endangered or threatened. In British Columbia, the grizzly bear is ranked S3 (Vulnerable, 2012) by the B.C. Conservation Data Centre and is on the provincial Blue list. The B.C. Conservation Framework ranks the grizzly bear as a priority #3 under goal 1 = contribute to global efforts for species and ecosystem conservation; priority #2 under goal 2 = prevent species and ecosystems from becoming at risk; and priority # 3 under goal 3 = maintain the diversity of native species and ecosystems.

Grizzly bears are protected under the B.C. *Wildlife Act*, which currently prohibits all licensed hunting of grizzly bears in B.C. They are also listed as a species that requires special attention to address the impacts of forest and range activities under the *Forest and Range Practices Act* (FRPA) and the impacts of oil and

gas activities under the *Oil and Gas Activities Act* (OGAA) (as described in the Identified Wildlife Management Strategy). Grizzly bears are identified as a provincial priority value under the Cumulative Effects Framework policy. In some regions of the province, such as the Great Bear Rainforest, grizzly bear critical habitats are protected by land use regulations that have been co-developed by the Province and First Nations.

Indigenous Peoples have been co-existing on the land with grizzly bears in British Columbia since time immemorial, and their historic stewardship of wildlife and habitat maintained a level of biodiversity and ecosystem health that hasn't been seen since British Columbia became a Crown colony almost two centuries ago. This framework was developed in collaboration with, or with the input from, delegates and knowledge holders from approximately 85 Indigenous governments and groups. The historical and ongoing success of Indigenous stewardship highlights the importance of incorporating Indigenous governance, world views, and knowledge to create a platform for collaborative stewardship for grizzly bears today and for future generations.

The goals of this provincial grizzly bear stewardship framework are to:

1. Summarize existing data to be used as a guide to advise on methods, research, data, approaches, and tools available to regional or local communities to fill knowledge gaps to increase the potential to realize locally desired outcomes for grizzly bears and their habitat.
2. Provide an adaptive approach that seeks to ensure the coexistence of healthy, fully functioning ecosystems and human communities (Ecosystem Based Management) for the co-development of regional or local grizzly bear stewardship plans based on western science and Indigenous knowledge. These plans will consider multi species relationships and cumulative effects of industrial activities, other human activities, and natural processes on grizzly bear conservation.
3. Support reconciliation with Indigenous Peoples through collaboration and partnership directed towards co-governance and joint, collaborative or consent-based decision making on initiatives related to grizzly bear conservation, management of human activities, and ecosystem-based stewardship.
4. Promote safe and respectful co-existence between grizzly bears and people.
5. Inform, educate, and be transparent and open about grizzly bear stewardship in British Columbia to the public, Indigenous governments, and legislators.

This document provides a summary of the stewardship approaches that should be considered to achieve these goals and more specific objectives that may be established at a local or regional level.

TABLE OF CONTENTS

ABOUT THE BRITISH COLUMBIA GRIZZLY BEAR (URSUS ARCTOS) STEWARDSHIP FRAMEWORK	I
ACKNOWLEDGEMENTS	III
EXECUTIVE SUMMARY.....	V
1 INTRODUCTION.....	1
1.1 Indigenous Governance, Worldviews, Knowledge, & Laws.....	1
1.2 Together for Wildlife	2
2 COSEWIC SPECIES ASSESSMENT INFORMATION.....	3
3 SPECIES STATUS INFORMATION	4
4 SPECIES INFORMATION	5
4.1 Species Description	5
4.2 Populations and Distribution	7
4.3 Habitat and Biological Needs of Grizzly Bears	13
4.4 Ecological Role.....	17
4.5 Limiting Factors	18
5 EFFECTS ON OTHER WILDLIFE.....	19
6 THREATS	19
7 CURRENT STEWARDSHIP APPROACH	34
7.1 Habitat Management	35
8 STEWARDSHIP FRAMEWORK GOALS	40
9 APPROACHES TO MEET STEWARDSHIP GOALS.....	40
9.1 Recommended Stewardship Actions	40
9.2 Tracking of human caused grizzly bear mortality	40
9.3 Local Planning.....	41
9.4 Inter-jurisdictional Planning.....	43
9.5 Population Inventory	44
9.6 Trend Monitoring.....	46
9.7 Habitat Protection and Restoration	48
9.8 Species and Population Stewardship	49
9.9 Hunting.....	54
9.10 Viewing.....	55
10 MEASURING PROGRESS	56
11 CONCLUSION AND NEXT STEPS.....	57
12 SUGGESTED READING	58
13 REFERENCES	58

LIST OF TABLES

Table 1. Status and description of grizzly bear population units (GBPU) in British Columbia.....	11
Table 2. Summary of essential functions, features, and description of grizzly bear habitat in British Columbia.	16
Table 3. Threatened grizzly bear population units in B.C. with performance measures and provincial level priorities for action.	53

LIST OF FIGURES

Figure 1. Female Grizzly bear in the Flathead valley of southeastern B.C. Note the shoulder hump, dish shaped face and long front claws.	7
Figure 2. Grizzly bear distribution in Canada/North America (IUCN, Bear Specialist Group). Note that grizzly bears are mistakenly shown to occur on Haida Gwaii and Vancouver Island.	9
Figure 3. Grizzly bear distribution and density in British Columbia as estimated by the province in 2018 (Ministry of FOR). The extirpated areas are currently being recolonized as are some coastal islands.....	10
Figure 4. The Grizzly Bear Diet Database.....	14
Figure 5. How roads affect bears.....	15
Figure 6. Examples of threat calculations for B.C.....	21
Figure 7. NatureServe Calculator - Conservation concern for all grizzly bear population units in B.C. except those areas that do not currently support a breeding grizzly bear population (grey areas on figure).	22
Figure 8. The number of calls per year to the BC Conservation officer service regarding grizzly bear conflicts with people and, the number of bears killed each year in conflict with people for grizzly (A) and black bears (B).....	23
Figure 9. Grizzly Bear Wildlife Habitat Areas and Specified Areas.....	35
Figure 10. Recorded non-hunting mortalities of grizzly bears in B.C. during 2000-2014. Note that the conservation risk due to non-hunting mortality is related to the proportion of bears killed and the reporting rate which likely varies around the province.	47

APPENDICES

Appendix 1. Approaches to meet Grizzly Bear Stewardship Objectives.....	61
Appendix 2. Grizzly Bear Management in the Great Bear Rainforest.....	64

1 INTRODUCTION

1.1 Indigenous Governance, Worldviews, Knowledge, & Laws

This section does not necessarily represent the views of any or all First Nations in B.C.

Indigenous governments always have and still do exist across the province. They are evolving as Indigenous peoples and nations rebuild, affirming and applying the right to exercise their laws, customs, institutions, jurisdiction, and knowledge in different contexts. Indigenous peoples' inherent title and rights are not frozen in time, continue to evolve through practice and custom, include attributes and perspectives unique to each Nation, and are not contingent on Crown recognition, court-declaration, or treaty articulation for their existence or exercise.

Indigenous Peoples in B.C. may share some common values, views, and practices. However, there are also real and sometimes significant differences among Nations and groups. Indigenous customs and laws have evolved over millennia in their particular context, and land and wildlife stewardship methods, protocols and procedures vary from Nation to Nation and at times within a Nation. Differences in kinship relations that extend beyond the human domain, Indigenous knowledge, worldviews, and laws all have evolved from a long-term and intrinsic connection with local landscapes and wildlife, including with respect to their relationships with, and their protection, stewardship and harvesting of Grizzly bears.

In 2019, the government of British Columbia passed the Declaration on the Rights of Indigenous Peoples Act (the "Declaration Act"), new legislation intended to support implementation of the United Nations Declaration on the Rights of Indigenous Peoples ("UNDRIP"). The Declaration Act creates a path for the Province to recognize and address the inherent rights of Indigenous Peoples, while seeking to create better transparency and predictability for all British Columbians.

Under the *Declaration Act*, the Province, in consultation and cooperation with the Indigenous Peoples of BC, must take all measures necessary to ensure the laws of B.C. are brought into alignment with UNDRIP. It will take time to achieve this outcome, as described in the [Declaration on the Rights of Indigenous Peoples Act Action Plan](#).

While this work is underway, the opportunity exists to advance the intent of the *Declaration Act* by working in consultation and cooperation with Indigenous Governing Bodies to develop new agreements, policies and plans to achieve better protection and stewardship of grizzly bears and their habitats. For example, the *Declaration Act* enables the Province, under section 7, to enter into joint or consent-based decision making agreements with Indigenous Governing Bodies. With section 7 agreements or similar arrangements in place, the Grizzly Bear Stewardship Framework can be implemented in a manner that recognizes and respects Indigenous People's role as decision makers and the work they do as wildlife stewards in their respective territories.

Meaningful consideration of Indigenous knowledge in the stewardship of grizzly bears will require an adaptive approach as new provincial legislation, regulations, policies and agreements regarding the sharing and use of Indigenous knowledge are developed and implemented. Best practices, guided by supporting provincial policy and identified through discussions with individual Nations will need to be developed and followed given the sensitivity and relationship of Indigenous knowledge to the knowledge keepers. Recognition of Indigenous laws and customs, as a key element for managing grizzly bears at a local level, can create a foundation for the sharing of Indigenous Knowledge and collaborative planning.

Examples of successful collaboration between provincial government agencies and Indigenous governments to improve wildlife stewardship already exist. For example, based on recommendations from the First Nation Wildlife Forum, work is underway to amend the *Wildlife Act* to support development of wildlife co-management agreements and a requirement to meaningfully consider and address Indigenous knowledge in wildlife decision making. As well, in the Great Bear Rainforest, co-developed land use regulations that protect critical Grizzly bear habitat have been in place since 2009.

Government-to-government processes related to wildlife stewardship should also connect to stakeholders and members of the public that have interest in the enhanced stewardship of Grizzly bears. Regional and sub-regional Wildlife Advisory Committees, as described in *Together for Wildlife*, may be a future space where shared understanding and commitment to action can be facilitated with considerations of Indigenous knowledge, laws and worldviews. Finding ways to reconcile the overlaps between Indigenous territories and provincial administrative boundaries will be a key step in the evolving process.

1.2 Together for Wildlife

The *Together for Wildlife* (the "[Strategy](#)") published in 2020, outlines a strategic pathway forward to improve wildlife stewardship and habitat conservation in BC. The Strategy lists 24 actions under 5 goals which will guide the work of BC, Indigenous Peoples, Stakeholders, and interest groups in BC.

Action 2 of the Strategy establishes commitment to advance stronger engagement and collaboration among provincial agencies, Indigenous governments, stakeholders and interested groups at the regional and where appropriate, sub-regional level. The goal is to have regional wildlife management staff and Indigenous Nation stewardship managers engage with industry, stakeholders, local governments, and the public in a manner that complements and supports government-to-government decision making. To that end, Indigenous Nations will be invited to join Regional Advisory Committees as intergovernmental partners.

Indigenous participation in regional or sub-regional wildlife committees will not replace the duty to consult with First Nations whose aboriginal or treaty rights may be impacted by government decisions. Regional advisory committees are intended to provide a forum in which knowledge and information can be shared and recommendations developed for the establishment and implementation of grizzly bear

population and habitat objectives, as well as coordinating implementation of commitments to management and stewardship intended to achieve those objectives.

With appropriate facilitation, regional committees will be forums for the review and development of input to decisions for grizzly bear stewardship. Recommendations from the Ministers Wildlife Advisory Council, the First Nations – BC Wildlife and Habitat Conservation Forum and from other regional First Nation groups and organizations will inform establishment of regional and sub-regional wildlife committees.

2 COSEWIC SPECIES ASSESSMENT INFORMATION

Assessment Summary: May 2012

Common Name: Grizzly Bear

Scientific Name: *Ursus arctos* Linnaeus, 1758

Status: *Special Concern* (Western Population)

Reason for Designation: (Western Population) The global distribution of this large-bodied bear has declined by over 50% since the 1800s, with western Canada representing a significant core of the current North American range. A habitat generalist, their distribution and relative abundance in the absence of humans is largely driven by habitat productivity and seasonality. The grizzly bear is highly sensitive to human disturbance and is subject to high mortality risk in areas of human activity and where roads create access. Population estimates in much of the range are highly uncertain; the Canadian population is estimated at 26,000, and the number of mature individuals is about 10,000. These estimates are based on extrapolation and expert opinion. Although, there is no evidence of a decline in the overall population during the past 30 years and increasing numbers of observation records indicate some range expansion in the far north and towards the fringes of their distribution in the south and southwest. A number of populations in the southern extent of its range in Alberta and southern BC are known to be declining, and there are concerns about unsustainable mortality rates in these areas and in parts of Yukon. There is strong evidence of genetic fragmentation in the southern parts of its range where some populations are increasingly isolated and subject to demographic stochasticity. Their poor condition in some parts of the range, combined with their naturally low reproductive rates and increasing pressures of resource extraction and cumulative impacts in currently intact parts of the range, heightens concern for this species if such pressures are not successfully reversed.

Criteria: (Western Population)

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. There is no evidence for an overall decline of mature individuals.

Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. The population is much larger than the threshold for this criterion, and there is no evidence for any declines.

Criterion C (Small and Declining Number of Mature Individuals): Not applicable. The total number of mature individuals may be as low as 10,000, but there is no evidence of continuing decline.

Criterion D (Very Small or Restricted Total Population): Not applicable. The population is larger than 1,000 individuals and exists in many more than 5 locations.

Criterion E (Quantitative Analysis): Not applicable. No quantitative analyses have been performed that can be applied to the whole DU. ^a

Occurrence: (Western Population) Yukon, Northwest Territories, Nunavut, British Columbia, Alberta, Saskatchewan, Manitoba

Status History: (Western Population) The species was considered a single unit and designated *Not at Risk* in April 1979. Split into two populations in April 1991 (Prairie population and Northwestern population). The Prairie population was designated *Extirpated* in April 1991. Status re-examined and confirmed in May 2000 and in May 2002. The Northwestern population was designated *Special Concern* in April 1991 and confirmed in May 2002. In May 2012, the entire species was re-examined, and the Prairie and Northwestern populations were considered a single unit. This newly defined western population was designated *Special Concern* in May 2012.

Source: COSEWIC = Committee on the Status of Endangered Wildlife in Canada.

^a See COSEWIC quantitative criteria and guidelines for the status assessment of wildlife species ([Table 2](#) of the COSEWIC assessment process guidelines: www.cosewic.gc.ca/eng/sct0/assessment_process_e.cfm)

3 SPECIES STATUS INFORMATION

Grizzly Bear ^a	
Legal Designation:	
FRPA : Species at Risk ^b	B.C. Wildlife Act: Schedule A SARA : Schedule 1 – Special Concern (2018) ^d
OGAA : Species at Risk ^b	
Conservation Status ^e	
B.C. List ^f : Blue B.C. Rank: S3 (2015) National Rank : N3N4 (2013) Global Rank: G4 (2002)	
Other Subnational Ranks : Alberta (S2), British Columbia (S3), Labrador (SX), Manitoba (SXB), Northwest Territories (S3), Nunavut (S3S4), Quebec (SX), Saskatchewan (SX), Yukon Territory (S3), Alaska (S4), Arizona (SX), California (SX), Colorado (SX), Idaho (S1), Kansas (SX), Minnesota (SX), Montana (S2S3), Navajo Nation (SX), Nebraska (SX), Nevada (SX), New Mexico (SX), North Dakota (SX), Oklahoma (SX), Oregon (SX), South Dakota (SX), Texas (SX), Utah (SX), Washington (S1), Wyoming (S1) ^g	
B.C. Conservation Framework (CF) ^h Priority ⁱ	
Goal 1: Contribute to global efforts for species and ecosystem conservation.	Priority #1 (2009)
Goal 2: Prevent species and ecosystems from becoming at risk.	Priority #2 (2009)
Goal 3: Maintain the diversity of native species and ecosystems.	Priority #3 (2009)
CF Action Groups :	Monitor Trends, Send to COSEWIC, Compile Status Report, Planning, Habitat Restoration, Private Land Stewardship, Habitat Protection, Species and Population Management, Review Resource Use

^a Data source: B.C. Conservation Data Centre unless otherwise noted.

^b Species at Risk = a listed species that requires special management attention to address the impacts of forestry and range activities under the *Forest and Range Practices Act* (FRPA; Province of British Columbia 2002) and/or the impacts of oil and gas

activities under the *Oil and Gas Activities Act* (OGAA; Province of British Columbia 2008) as described in the Identified Wildlife Management Strategy (Province of British Columbia 2004)

^c Schedule A = designated as wildlife under the B.C. *Wildlife Act*, which offers it protection from direct persecution and mortality (Province of British Columbia 1982).

^d Schedule 1 = found on the List of Wildlife Species at Risk under the *Species at Risk Act* (SARA; Government of Canada 2002)

^e Blue: Includes any indigenous species or subspecies considered to be of Special Concern (formerly Vulnerable) in British Columbia.

^f S = subnational; N = national; G = global; T = refers to the subspecies level; B = breeding; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable.

^g Data source: NatureServe.

^h Data source: B.C. Ministry of Environment and Climate Change Strategy (2009).

ⁱ Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

4 SPECIES INFORMATION

From both an Indigenous knowledge and western science perspective, grizzly bears have been well observed and studied throughout most of their range in North America. In order to increase readability citations have been removed from this framework. Suggested Readings and References are provided at the end of this document.

Similarly, grizzly bears have been well observed and studied in BC although there are many life history strategies possible over the varied topography and distribution of key foods in BC and not all have been equally well described.

Indigenous Peoples throughout most of BC have been co-existing with grizzly bears since time immemorial and continue to do so. Grizzly bears play an important role in many, but not all, Indigenous cultures. They fulfil the roles of stewards and guardians of the land and are seen as a living embodiment and extension of the land itself. Creation stories speak to how they preceded humans on earth, and taught humans what to eat and how to survive. They are symbols of strength and power, often revered, and always respected. In some parts of the province, grizzly bears are considered by Indigenous Peoples to be family members, a part of the community; everyone in a family and community is better off if all its members are taken care of.

4.1 Species Description

Evolution and Nomenclature

Paleontology research suggests that all living and extinct bears of the genus *Ursus* descended from *U. minimus*, a small forest dwelling bear of the Pliocene (2.5-5.3 million years ago). The grizzly bear differentiated from the Etruscan Bear (*Ursus etruscus*) in Asia during the middle Pleistocene (2-3 million years ago). The most recent common ancestor of the grizzly bear is thought to be the Ussuri Brown Bear (*U. a. lasiotus*) of northeastern Asia, although inferences from the genomic era suggest that complex and common admixing even among species makes the identification of a recent common ancestor tenuous.

The earliest records of the modern grizzly bear are from about 500,000 years ago from China. Fossil deposits suggest the species entered Europe about 250,000 years ago, then began colonization of North America via Beringia during the Wisconsin glacial period less than 75,000 years ago. Recession of the continental ice sheets, and perhaps the extinction of the short-faced bear (*Arctodus simus*) may have allowed expansion into Alaska and then most of North America by the early Holocene less than 11,000 years ago. This work suggests the grizzly bear is a relative newcomer to North America.

Early taxonomic classification relied on morphological data. Geographic variation across the North American grizzly bear's range originally resulted in the description of more than 90 subspecies in Canada, the United States, and Mexico. This classification was later superseded and refined to the widely accepted identification of two subspecies, *U. a. middendorffi*, identifying the large bears from the Kodiak Island archipelago, and *U. a. horribilis*, for the remainder of North America and has, so far, been supported by genetic inferences.

The term 'brown bear' is generally used to describe the species regardless of local variant. In Europe, Asia, and coastal Alaska, *U. arctos* are called brown bears. 'Grizzly bear' is most often used in North America, except coastal Alaska. Regional names are sometimes used to describe North American variants such as 'Kodiak bear', 'Alaskan brown bear', and 'barren-ground grizzly bear'.

Physical Characteristics

The grizzly bear is the second largest terrestrial carnivore in North America (Figure 1). They have a strong, heavy body with an average length of 1.8 m from nose to tail. Grizzly bears are distinguished from the black bear, *U. americanus*, and polar bear, *U. maritimus* by the large shoulder hump that supports their powerful front legs, long front claws (often 70 mm) and a concave facial profile of a large head. Both the hump and the claws are traits associated with a grizzly bear's exceptional digging ability. The grizzly bear's pelage is usually darkish brown, but can be light cream, or any shade of brown or even black. Interior grizzlies generally have long guard hairs on their shoulders that often are tipped with white, grey, or silver, which gives the fur a 'grizzled' appearance from which it derives the name "grizzly". Their legs and feet tend to be darker in colour than the body. Coastal dwelling bears generally have shorter guard hair and are most often brown and lack the grey/silver coloration seen in interior grizzly bears.

Typical body mass of an adult female in BC ranges is 100-150 kg, but female grizzly bears that eat a lot of meat such as salmon, can weigh more than 200 kg. Males are commonly twice the weight of females. Despite their large size, the grizzly bear has been known to run at speeds of 55 km per hour. Grizzly bears have well developed senses of smell and hearing.



Figure 1. Female Grizzly bear in the Flathead valley of southeastern B.C. Note the shoulder hump, dish shaped face and long front claws. (Photo - Troy Malish).

4.2 Populations and Distribution

Global:

Grizzly bears are the widest ranging of the eight extant bear species. They are found across parts of Asia, Europe, and North America and historically inhabited North Africa. In North America, grizzly bears previously ranged throughout Alaska, Yukon, and the Northwest Territories south to northern Mexico, and from the British Columbia coast to the western shores of Hudson Bay and the Ungava Peninsula (Figure 2).

Today, in North America the species is found in Alaska, the western and central portions of the Canadian North, south through British Columbia and the western portion of Alberta in the Rocky Mountains and Foothills. They extend into portions of the northwestern United States (including Idaho, Montana, Washington, and Wyoming), extending as far south as Yellowstone and Grand Teton National Parks (YNP and GTNP; Figure 2). Combining Canada and the United States, grizzly bears inhabit approximately half the area of their historical range with most of this loss in the lower 48 states and the Canadian prairies. Grizzly bears can be found from sea level to high-elevation alpine environments far above tree line. Their habitat is diverse, ranging from temperate coastal rain forests to alpine tundra, boreal forest to dry grasslands and Arctic tundra.

In the lower 48 states of the US there are about 1,500 grizzlies. About 800 of these bears live in Montana, and 600 more in the Yellowstone-Teton area of Wyoming and both these populations are currently increasing and expanding their range. There are an estimated 180-200 grizzly bears in northwestern Montana, northern Idaho and eastern Washington in 3 fragmented but increasing populations, 2 of which are shared with B.C. In the connected North Cascades ecosystem of Southwest BC and northern Washington, grizzly bear populations are functionally extirpated.

With an estimated population of 33,000, Alaska has more grizzly bears than any state or province/territory in North America. The highest densities are along the coast where salmon are most abundant and available. Katmai National Park (551 bears/1000 km²) and Admiralty Island National Monument (400 bears/1000 km²) protect the densest known populations in North America.

In Canada, there are approximately 26,000 grizzly bears occupying British Columbia, Alberta, the Yukon, the Northwest Territories, Nunavut, and the northern part of Manitoba (Figure 2). In 2003, researchers found a grizzly bear on Melville Island in the high Arctic, which is the most northerly sighting documented in recent times. Grizzlies may have been present in recent times in the tundra areas of the Ungava Peninsula and the northern tip of Labrador-Quebec where skeletal remains have been found.



Figure 2. Grizzly bear distribution in Canada/North America (IUCN, Bear Specialist Group). Note that grizzly bears are mistakenly shown to occur on Haida Gwaii and Vancouver Island.

British Columbia:

About half of Canada's grizzlies live in B.C. Grizzly bears are found throughout most of mainland B.C. and inhabit approximately 90% of their original range (Figure 3). In 2018, about 15,000 grizzly bears were thought to live in B.C., about a quarter of the entire North American population.

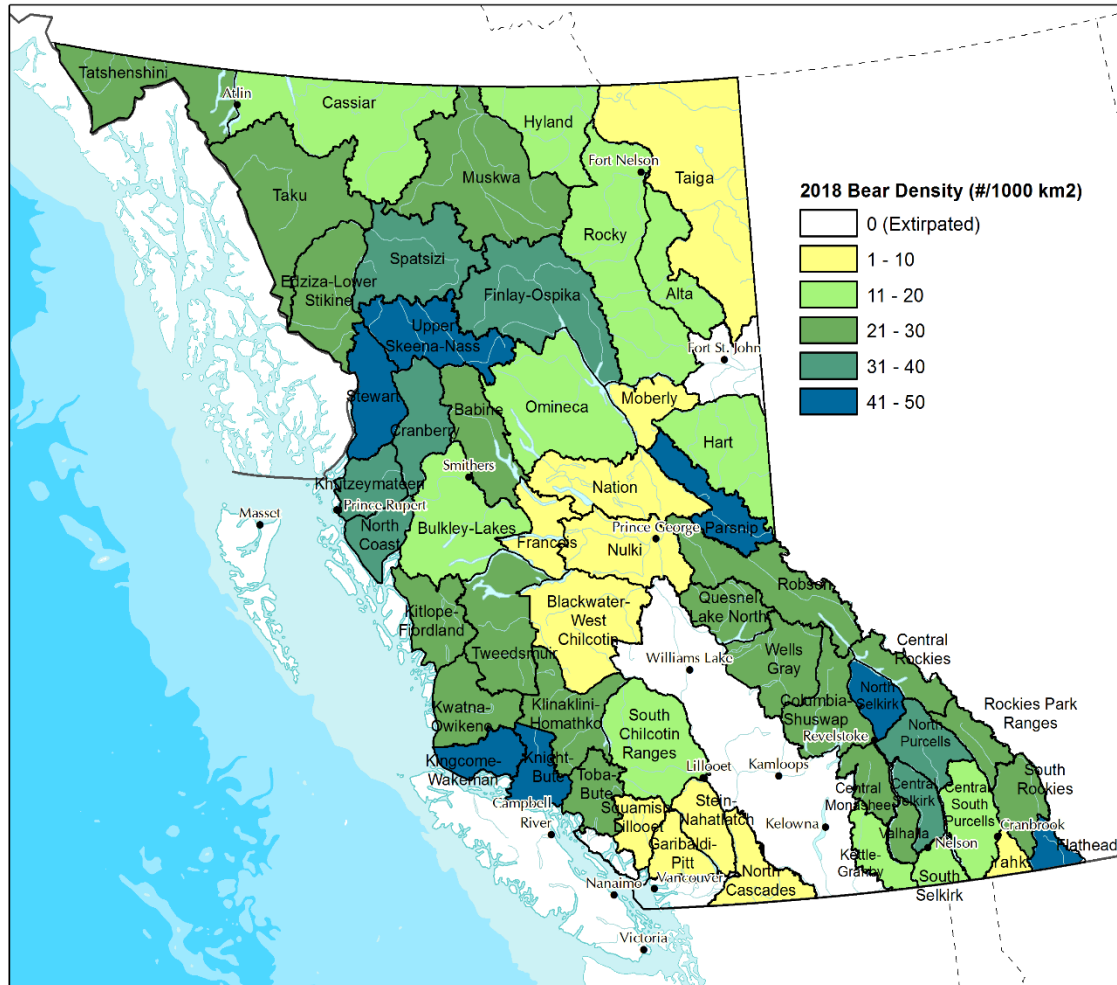


Figure 3. Grizzly bear distribution and density in British Columbia as estimated by the province in 2018 (Ministry of FOR). The extirpated areas are currently being recolonized as are some coastal islands.

In B.C., grizzlies are currently managed in 55 Grizzly Bear Population Units (GBPU); these units were created to facilitate stewardship of the species, particularly determining which populations were able to sustain a hunt and how hunting opportunities were allocated, though population connectivity was one factor considered when units originally delineated in 1996 (Table 1).

Populations in three GBPU’s are listed as an extreme conservation concern, 14 are high concern, 14 moderate and 24 are considered of low conservation concern. The lower Fraser Valley/Lower Mainland population is listed as extirpated. They are very rare on the Sunshine Coast, central interior from the US border to north of Quesnel, and northeast BC around the Peace River Lowlands near Fort St. John and Dawson Creek. Grizzly bears are also rare recent migrants to Vancouver Island and are not present on Haida Gwaii and many other smaller coastal islands. At any given time, the number of grizzly bears on Vancouver Island is thought to be fewer than 10 individuals. People are encouraged to record (photos, video) and report any grizzly bear sightings on Vancouver Island to the regional wildlife office in Nanaimo.

Conservation rankings for grizzly bears in B.C. are based on the best available provincial knowledge at their time of ranking and several discrepancies with local information and data have been flagged, especially in salmon consuming GBPU's. Through Indigenous knowledge and science and, territorial, regional, and local planning processes, it is anticipated that improvements to the information used to classify GBPU's, including amendments to their boundaries may result in increased confidence and acceptance of GBPU classification.

Table 1. Status and description of grizzly bear population units (GBPU) in British Columbia. Population size and density estimates (bears/1000 km²) come from a combination of field-based inventories, model derived estimates and professional opinion of government wildlife staff. Conservation concern is highlighted with red being greatest concern grading to dark green being least concern. Threat level was based on professional opinion until 2012 and a modified NatureServe ranking method at the provincial scale for the 2019 analysis (https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/grizzly-bears/bc_gbpu_2019_ranking.pdf). Conservation concern in 2019 did not include local level information and many will need to be adjusted based on local input.

GBPU Name	2018 Population Estimate	2018 Estimated Bear Density	Estimation Method	Threat level 2012	2019 Conservation Concern Rank
Alta	132	10	expert opinion	Viable	M3: Moderate
Babine	313	23	model/expert opinion	Viable	M3: Moderate
Blackwater-West Chilcotin	53	2	model/expert opinion	Threatened	M3: Moderate
Bulkley-Lakes	439	20	expert opinion	Viable	M3: Moderate
Cassiar	611	17	model/expert opinion	Viable	M5: Very Low
Central Monashee	147	23	model/expert opinion	Viable	M2: High
Central Rockies	169	28	model	Viable	M4: Low
Central Selkirk	188	34	model	Viable	M3: Moderate
Central-South Purcells	176	16	inventory	Viable	M2: High
Columbia-Shuswap	318	25	model/expert opinion	Viable	M2: High
Cranberry	352	31	model/expert opinion	Viable	M4: Low
Edziza-Lower Stikine	398	29	model	Viable	M5: Very Low
Finlay-Ospika	971	33	model	Viable	M5: Very Low
Flathead	140	40	inventory	Viable	M2: High
Francois	58	7	expert opinion	Viable	M2: High
Garibaldi-Pitt	3	1	inventory	Threatened	M1: Extreme
Hart	244	12	model/expert opinion	Viable	M3: Moderate
Hyland	231	13	expert opinion	Viable	M5: Very Low
Kettle-Granby	87	13	inventory	Threatened	M2: High
Khutzeymateen	277	38	model/expert opinion	Viable	M4: Low
Kingcome-Wakeman	199	41	inventory	Viable	M4: Low

Kitlope-Fiordland	214	23	expert opinion	Viable	M4: Low
Klinaklini-Homathko	251	20	model/expert opinion	Viable	M4: Low
Knight-Bute	250	47	inventory/expert opinion	Viable	M4: Low
Kwatna-Owikeno	229	25	expert opinion	Viable	M4: Low
Moberly	71	9	model	Viable	M2: High
Muskwa	840	24	model	Viable	M5: Very Low
Nation	170	10	inventory/expert opinion	Viable	M3: Moderate
North Cascades	6	1	expert opinion	Threatened	M1: Extreme
North Coast	190	30	expert opinion	Viable	M3: Moderate
North Purcells	332	39	model	Viable	M3: Moderate
North Selkirk	265	49	model	Viable	M3: Moderate
Nulki	44	3	model/expert opinion	Viable	M2: High
Omineca	402	14	model/expert opinion	Viable	M5: Very Low
Parsnip	455	43	model/inventory	Viable	M5: Very Low
Quesnel Lake North	187	22	model/expert opinion	Viable	M3: Moderate
Robson	534	28	model/inventory/expert opinion	Viable	M3: Moderate
Rockies Park Ranges	116	20	model	Viable	M2: High
Rocky	538	14	model/expert opinion	Viable	M3: Moderate
South Chilcotin Ranges	222	12	inventory	Threatened	M3: Moderate
South Rockies	170	21	inventory	Viable	M2: High
South Selkirk	58	14	inventory	Threatened	M2: High
Spatsizi	666	32	model	Viable	M5: Very Low
Squamish-Lillooet	46	9	inventory	Threatened	M2: High
Stein-Nahatlatch	22	3	inventory	Threatened	M1: Extreme
Stewart	358	40	expert opinion	Viable	M5: Very Low
Taiga	94	2	model/expert opinion	Viable	M4: Low
Taku	576	21	expert opinion	Viable	M5: Very Low
Tatshenshini	407	28	model	Viable	M4: Low
Toba-Bute	130	21	inventory	Viable	M4: Low
Tweedsmuir	368	22	model/expert opinion	Viable	M5: Very Low
Upper Skeena-Nass	755	47	model	Viable	M5: Very Low
Valhalla	88	25	model	Viable	M2: High
Wells Gray	345	25	model/expert opinion	Viable	M4: Low
Yahk	20	7	inventory	Threatened	M2: High

4.3 Habitat and Biological Needs of Grizzly Bears

Grizzly bears are wide-ranging omnivores that require large areas to meet their life requisites. Across their range, the species is a habitat generalist occupying temperate rain forests, montane forests, boreal forest, subalpine forests and meadows, alpine, subarctic taiga, arctic tundra, and even sagebrush and grasslands. The major factor influencing grizzly bear habitat choice within a bear's home range is the abundance and distribution of food and the presence of humans, who they commonly avoid. Roads bring bears and people closer together, which can create conflicts that lead to mortality, but they are also avoided like any other human development, which can cause reduction in density.

Grizzly bears must gain sufficient energy and protein reserves in a six to eight-month active season for hibernation and reproduction, so they concentrate their feeding in habitats with an abundance of high-quality foods. Grizzlies learn to use specific locations with abundant food, and these become centers of activity within a home range.

While considered omnivorous, grizzlies eat primarily plant-based foods in many areas. Habitat selection often varies among individuals. For example, during fall some bears in an area eat mostly fish while others eat mostly berries. An individual's diet can vary from near complete herbivory to near complete carnivory within a population. There may also be significant variation in habitat selection within a population based on sex, age, and reproductive status, with lone adults often occupying habitats that are higher quality, relegating subadults and females with dependent offspring to riskier or lower quality habitats.

Habitats preferred by grizzly bears change over the year. Seasonally important habitats have usually been separated into (1) spring/early summer or pre-berry/pre-salmon period, and (2) summer/early-fall salmon and berry producing period, and sometimes include a post-berry period. During spring, bears often use low elevation habitats, eating winter-killed and new-born ungulates, and emergent vegetation such as grasses and forbs, and roots. Riparian habitats are often important at this time. Other bears remain high in the mountains during spring and forage on wind-blown ridge-tops or early emergent vegetation on avalanche slopes. Avalanche paths are key spring feeding habitats in many areas but not all avalanche paths are used. High use avalanche paths are often the sub-hygric or wetter paths. During late spring, some bears move to higher elevations following the phenological green-up of vegetation, while many remain in valley bottoms or move to ungulate calving areas to hunt new-born ungulates.

During summer/early fall, many bears move to areas where berries are found. Summer and fall are also when salmon reach spawning channels and may be available to bears. The berry and salmon season is when bears gain most of their weight for hibernation. Animals such as ants and other insects, ground squirrels (*Spermophilus* spp.), marmots (*Marmota* spp.), and ungulates are also taken in spring and summer. A review of diet observations by biologists across BC documented that bears eat many different foods but that some plants and berries are eaten wherever they occur and are perhaps more important to population health. This report includes a spreadsheet tool to allow users to summarize diet observations by ecoprovince to characterize diet by ecosystem without going in the field. It is available here: <https://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=59121>.

The Grizzly Bear Diet Database

Grizzly bears are an iconic part of British Columbian landscapes, from coastal rainforests to interior mountains. To understand grizzly bear habitat use and identify potential threats, it is important to know what foods make up their diet.

Because grizzly bears live in so many different ecosystems, the foods they eat can differ from region to region. A bear feeding in coastal estuaries in spring won't have the exact same diet as a bear foraging along interior rivers.

This means generalized descriptions of grizzly bear diets may not accurately reflect their regional habitat needs. Nevertheless, there are a number of foods that are eaten everywhere they occur, which suggests they are provincially important.

The B.C. Government has compiled a list of grizzly bear plant and animal foods documented by bear researchers across five distinct ecological areas in the province.

Using this publicly available database, habitat biologists, land use planners and decision-makers can identify:

- Foods eaten wherever they occur in grizzly range.
- Foods that are important within select regions.
- Other, more sporadically used foods.

This data can enable more cost-effective and accurate habitat mapping and impact assessments. This is useful in a wide variety of contexts – for example:

- More easily tailor impact assessments of a pipeline project to reflect different grizzly bear habitat needs along its proposed length.
- Assign ski hill permit conditions to minimize impacts to key foods in a local watershed.
- Better predict how climate change will affect grizzly bear nutrition and population health.

The Grizzly Bear Diet Database equips biologists and land managers with key information on grizzly bear foods, enabling more effective conservation of this iconic species. To access the database visit: <https://tinyurl.com/3a9kpzt9>

Have questions about the database? Contact:
 Grant MacHutchon at machutchon@uniserve.com
 Garth Mowat at Garth.Mowat@gov.bc.ca
 You can also reach us at: fishandwildlife@gov.bc.ca

Figure 4. The Grizzly Bear Diet Database

Hibernation is an adaptive strategy to avoid seasonal limitations in food. Unlike most hibernators, grizzly bears can be aroused while hibernating and disturbances while denning can result in fitness costs if bears become active during this period. In mountainous areas, grizzly bear dens are often in alpine and timbered subalpine areas, while in flatter areas, bears den on other sloped areas including small drainage slopes. Dens may be located in natural caves, hollows under the roots of trees or excavated on steep slopes ranging from 55-90%. Most dens are located to ensure a long-lasting snow cover. Dens are usually located in areas where soils are well drained to prevent flooding and in soils cohesive enough to maintain the physical stability of the den.

Some human-disturbed habitats, like road allowances, logged areas, seismic lines, and reclaimed well sites and pipelines may attract bears to feed. Areas of human activity are generally used less frequently by bears or characterized by high human-caused mortality. For instance, road use is affected by traffic volume, where some bears avoid the road when the traffic is high (Figure 5).

How roads affect bears:

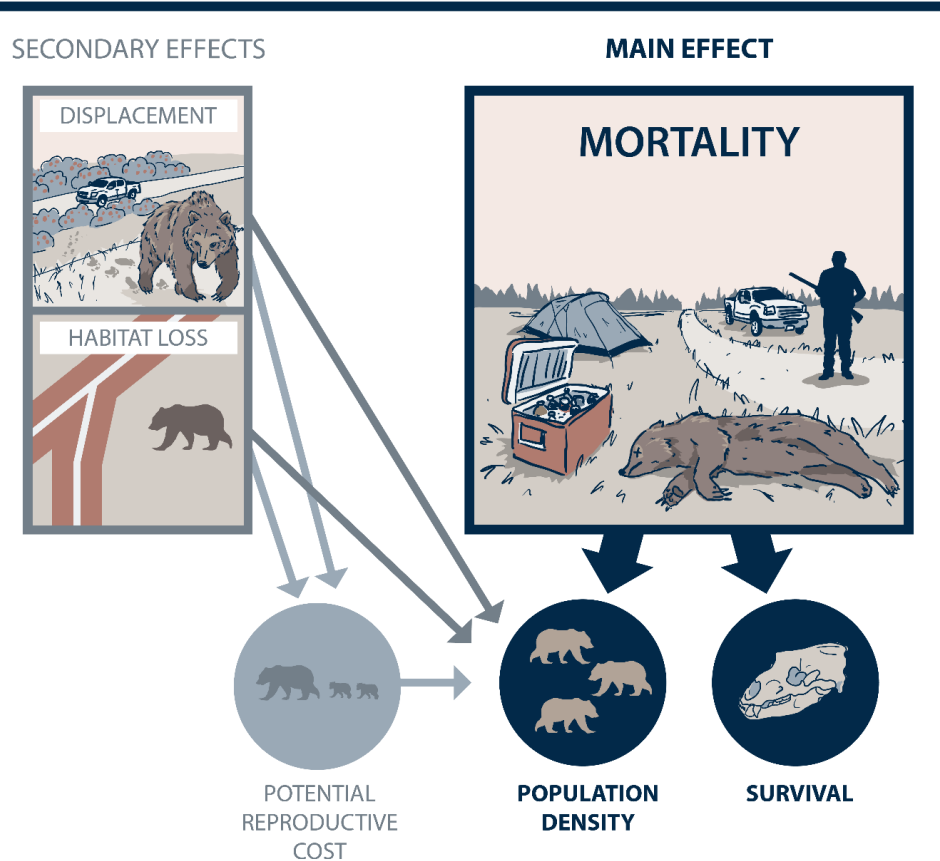


Figure 5. How roads affect bears

Roads may remove habitat entirely, cause disturbance such that habitat is avoided, or lead to bear-human conflicts. Mitigating the effects of motorized access will lead to the greatest benefits to the local bear population if:

- roads cross the highest quality grizzly bear habitats or occur in areas with rich food resources (e.g., productive berry patches or salmon streams);
- open road densities exceeded 0.6 km/km^2 ; and
- less than at least 60% of the management unit's area is secure habitat (i.e., $> 500 \text{ m}$ from an open road in patch sizes of at least 10 km^2). Medium quality habitats containing non-limiting resources such as riparian areas or avalanche chutes should be managed close to or below 0.6

km/km² and with at least 60% of the management unit in secure habitat. The portions of the management unit with lower quality habitats can be managed at road densities > 0.6 km/km².

Much of the productive lands in the contiguous 48 states and southern Canada are dominated by anthropogenic influences. For bear populations in these areas, human settlements and alteration of the landscape limits habitat choices and fragments populations and can impact individual bears through increased stress and disturbance. Reduction in habitat use by grizzly bears can extend over a land area much larger than that occupied by the development itself. Consequently, assessments of grizzly bear habitat commonly apply indicators of functional habitat loss in consideration of the effects of human activities.

There are large areas of British Columbia that have few human residents. Many of these areas are still affected by human use such as logging, oil and gas exploration and extraction, and mining, and these developments often reduce habitat quality and bring people into encounters with bears. Some areas offer habitat protection for grizzly bears, such as the Muskwa-Kechika Management Area or the Great Bear Rainforest. Kaska Dena Dene K'eh Kusān have asserted additional areas for habitat protection such as the Kwadacha Indigenous Protected and Conserved Lands, which is one of the largest remaining pristine and intact lands in North America. They have proposed another Indigenous Protected Area in the Ingenika Watershed in the Omineca Region. There are also parks in the province that provide habitat protection, although few are as large as the above-mentioned areas, and weren't necessarily designed to maintain connectivity of wildlife habitats. Large protected and connected areas provide the greatest long-term conservation certainty for grizzly bears and serve as source populations that can support populations in adjacent areas if they experience losses or declines. Key to grizzly bear persistence in B.C. is how we live and manage the lands between protected areas, and connecting our smaller protected areas with corridors, may improve their functionality to grizzly bears. **NEED TO ADD A REFERENCE TO TABLE 2 SOMEWHERE!**

Table 2. Summary of essential functions, features, and description of grizzly bear habitat in British Columbia. These components are essential for either the health of individuals or populations.

Component	Function(s) ^a	Feature(s) ^b	Description
Winter dens	Dens provide refuge from weather and people where individuals can safely pass the winter and give birth.	The physical attributes of dens vary greatly among ecosystems, but most are high in the mountains in B.C.	Sites with long-lasting snow cover for insulation, soils that are well drained to prevent flooding, and cohesive enough to maintain physical stability.
Seasonally important forage sites	Regionally preferred forage species that allow individuals to gain weight needed for denning and reproduction.	Varies greatly among forage type selected however, foods selected during this season are usually highly clustered and patchy allowing individuals to forage intensely in one area for many consecutive hours or days.	Sites with accessible energy rich food such as: salmon, berries, whitebark pine seeds, or carcasses including 'gut piles' from animals killed by hunters which are often at low elevations in areas used by people.
Spring forage sites	Provide protein-rich new-growth plant-based	Often sites with early green-up such as low elevation riparian areas, estuaries,	Sites that green-up early in the year and support preferred forage;

Component	Function(s) ^a	Feature(s) ^b	Description
	foods or winter killed/weakened ungulates or their newborns (neonates).	south facing slopes, southwest facing avalanche chutes or even roadsides and pipeline corridors. Energy rich roots and tubers are also eaten.	avalanche run-out zones and other places where winter killed ungulates may be found; coastal estuaries especially sedge flats; south facing avalanche chutes that are herb dominated; pipeline right-ofways; ungulate calving areas.
Interpopulation connectivity habitat	The process of integrating new individuals into an existing population. This includes the rescue effect provided by movement among sub-populations.	Suitable space that allows bears to move among sub-populations safely.	Zones that provide safe connectivity with adjacent populations. Habitat type is less important than security from human disturbance or persecution.
Source populations	Provide abundant young that can emigrate to nearby areas to support less stable populations.	These areas must be large enough to support a self-sustaining bear population and protected from human-caused habitat and population losses.	Large populations that have low human disturbance and mortality and are spatially connected to other populations or sub-populations that are not self-sustaining.

^a Function: a life-cycle process of the species (e.g., include either animal or plant examples: spawning, breeding, denning, nursery, rearing, feeding/foraging, and migration; flowering, fruiting, seed dispersing, germinating, seedling development).

^b Feature: the essential structural components of the habitat required by the species.

4.4 Ecological Role

Indigenous knowledge of grizzly bears passed down through generations of oral history and stories or learned throughout the experiences of Indigenous Peoples living today suggests that grizzly bears act as a strong indicator of the ecological and cultural health of a landscape through their physical presence and influence on plants, animals, and humans. Many First Nations speak to the power of the grizzly bear, and the grizzly bear's role as stewards or guardians of the land and animals. Grizzly bears, like humans, were acknowledged as a living embodiment and extension of the land. Some Nations feel strongly that grizzly bears should be viewed as part of a community in their environment, not as a stand-alone species, and that ecosystem health should be prioritized in their stewardship.

Grizzly bears are commonly referred to as an “umbrella species”, meaning that conservation efforts that benefit grizzly bears can have positive impacts on many other species within the ecosystem.

The relationship that grizzly bears have with other plant and animal species is complex. Predation is an important ecological process and grizzly bears are apex predators that commonly feed on ungulates (especially neonates), ground squirrels, marmots, and anadromous fish. There is regionalized evidence that there is a regulatory role played by bears upon their prey in some ecosystems. For instance, grizzly

bear predation upon refugee populations of Arctic ground squirrels (*Spermophilus undulates*) helped maintain relatively constant population sizes (i.e., regulatory effect). For salmonids and ungulates, where the salmon or ungulate population is at low density, grizzly bear predation may contribute to holding populations below a habitat's carrying capacity, however further research is needed to better understand these relationships in different ecosystems.

Grizzly bears play an essential role in nutrient distribution from salmon and other marine species into forests, both through predation and scat. Nutrient inputs and their cycling are key processes controlling the productivity of ecosystems. Nitrogen is frequently a limiting nutrient in northern forests. Principal sources of input are from atmospheric deposition and Nitrogen-fixing plants. However, freshwater and riparian ecosystems may also benefit from marine-derived nitrogen from the bodies of salmon or other anadromous fish returning to their natal freshwater streams to spawn. The implications of animal-distributed nitrogen from fish to the forest are widespread throughout food webs.

When abundant, grizzly bears are an important disperser of seeds for the numerous plant species producing fruits because they eat large quantities and commonly excrete seeds that can later germinate. Scats commonly contain thousands of seeds and passage through the digestive system improves germination rates. The seeds of Whitebark pine, an endangered species, are a preferred forage and heavily used where whitebark pine is still abundant.

Grizzly bears may structure plant communities and influence nitrogen availability when they dig for roots and corms such as glacier lily bulbs. Deep holes that grizzly bears dig for ground squirrels initially have lower species diversity than adjacent mature areas, however as the area around digs matures, the number of plant species is greater than similar, mature areas without digs - suggesting that bear digs contribute to the overall diversity of communities.

Despite the ecological role that grizzly bears play, their importance to ecosystem function varies. Grizzly bear foraging is more likely to redistribute nutrients or seeds or maintain plant community structure where grizzly bears are at higher densities. Similarly, because grizzly bears occur at low densities in many parts of North America, and may only feed on prey opportunistically, in most cases their impact on prey densities may be limited.

4.5 Limiting Factors

A major factor limiting grizzly bear population growth is their low rate of reproduction. Grizzly bears have one of the lowest reproductive rates among terrestrial mammals in North America due to their late age of first reproduction and the long interval between litters. In some regions of North America, it may take a female more than 10 years to replace herself in a population. Typical females may give birth to a maximum of 10 cubs before they stop breeding in their mid- to late 20s. In places, half of these cubs will die within their first year of life. Surviving cubs usually remain with the mother for 2 or 3 years resulting a 3-to-4-year interbirth interval although birth intervals as long as 6 years have been observed. Reproduction is higher in more productive habitats.

Habitat quality affects population density through availability of spawning salmon and high-energy plant foods such as huckleberry. Populations with abundant available salmon along coastal Alaska may have one hundred times more bears than areas of poor habitat such as barren grounds or boreal forests. A strong relationship between population density and forage abundance has been found. Changes in these important foods are also linked to fluctuations in abundance and distribution of bears.

In some areas, small, isolated grizzly bear populations have significantly elevated conservation risk. Based on the International Union for the Conservation of Nature Red List, Grizzly bears along much of the southern fringe of their distribution in B.C. occur in small semi-isolated populations, including in the North Cascades, Stein-Nahatlatch, Yahk, and the South Selkirk Mountains GBPUs and some extirpated areas adjacent to existing GBPUs.

5 EFFECTS ON OTHER WILDLIFE

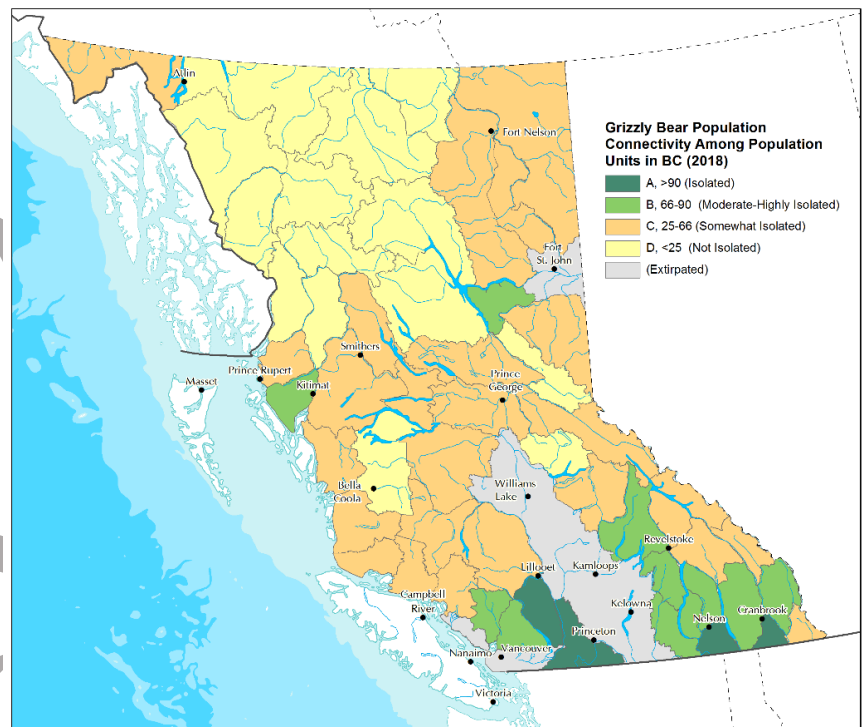
There are many ecological zones in B.C. and the ability of grizzly bears to exploit terrestrial and aquatic foods results in various ecological roles within the communities they inhabit. In areas where salmon are not present, grizzly bears likely have higher predation on ungulates and other wildlife species. Grizzly bears can be a top-down limiting factor on prey species, largely through predation on neonate ungulates. Studies in Alaska, British Columbia, and the Yukon Territory have shown that grizzly bears often kill moose and caribou calves in some areas.

Interactions among grizzly bear and other apex predators such as wolves, cougars, and black bears are complex and can range from negligible to high, depending on the density of grizzly bears. These effects can result in reduced kill rates by wolves, displacement of black bears from important habitats, and displacement of cougars from kill sites. Other ecological influences include the ability of grizzly bears to disperse seeds, cultivate soil, and increase nitrogen in alpine areas, and the fertilization of upland riparian habitat adjacent to salmon spawning streams. Overall, ecological interactions are complex and include many factors such as sex of the bear, population densities of predators and prey, and geographic area of occupancy.

6 THREATS

Human activities and developments have a cumulative impact that affect individual bears and therefore populations by causing energetically expensive reactions by bears that disrupt their normal behaviour, displace them from high quality habitats, alter bear habitats, disrupt the bears' social system, or increase mortality rates because of increased contact with hunters, anglers, other land and resource users, or residents (see the remainder of the threats section for more detail). Grizzly bears can adapt to many habitat changes and a temporary increase of human presence; however, many activities and development result in increased motorized access. An increase in bear mortality or permanent displacement can occur if the access is long term and there is an increase of human activity or settlement. Areas with little human disturbance that are far from disturbance generally support more bears.

The impact of various threats to grizzly bears were estimated for individual GBPU's using a modified version of the NatureServe elemental calculator. The calculator assigns one of 5 classes of overall threat impact: Negligible, Low, Medium, High, or Very High. The NatureServe calculator summarizes the individual impacts of 11 IUCN threat categories to determine cumulative impacts to species (residential and commercial development, agriculture and aqua-culture, energy production and mining, transportation and service corridors, biological resource use, human intrusions and disturbance, natural system modifications, invasive and other problematic species and genes, pollution, geological events, climate change and severe weather, and how these threats impact connectivity). Figure 6 shows examples of some of the threat calculations for B.C. Threat impact estimates within different threat categories are based on threat scope and severity. The NatureServe calculator combines the individual IUCN threat impact estimates to determine the overall threat impact class (for a chosen population unit).



DR

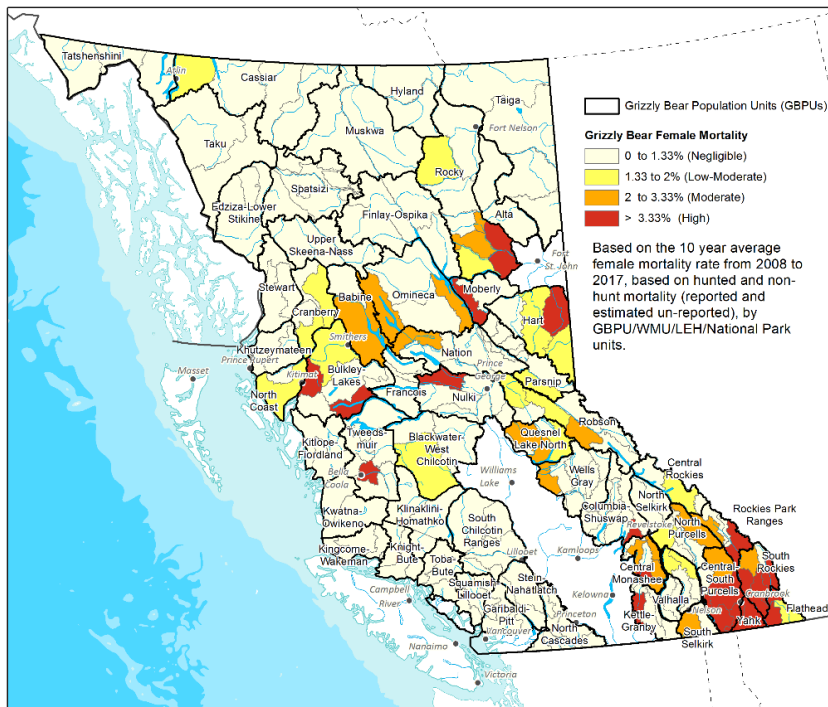


Figure 6. Examples of threat calculations for B.C.

Spatial metrics of mortality risk, population isolation, and food quality were used to estimate provincial and GBPU specific threats. These metrics were similar to those used in a provincial scale cumulative effects assessment for grizzly bears. The outcome of that analysis is presented visually in Figure 7 below. The final assignment for each unit does not include on-going mitigation measures in most cases. Nor does it include local knowledge or very recent changes to threats such as the hunting closure in 2017 or reduction in salmon available on the Chilko River due to the 2019 landslide on the Fraser River. Future population unit level plans and objectives should address mitigation measures, include local knowledge, and re-evaluate present and future local threats. Hence, the threat assignments shown in Figure 7 should be considered general and subject to modification. Discrepancies between this ranking outcome and Local Ecological Knowledge have been identified for coastal GBPUs and others.

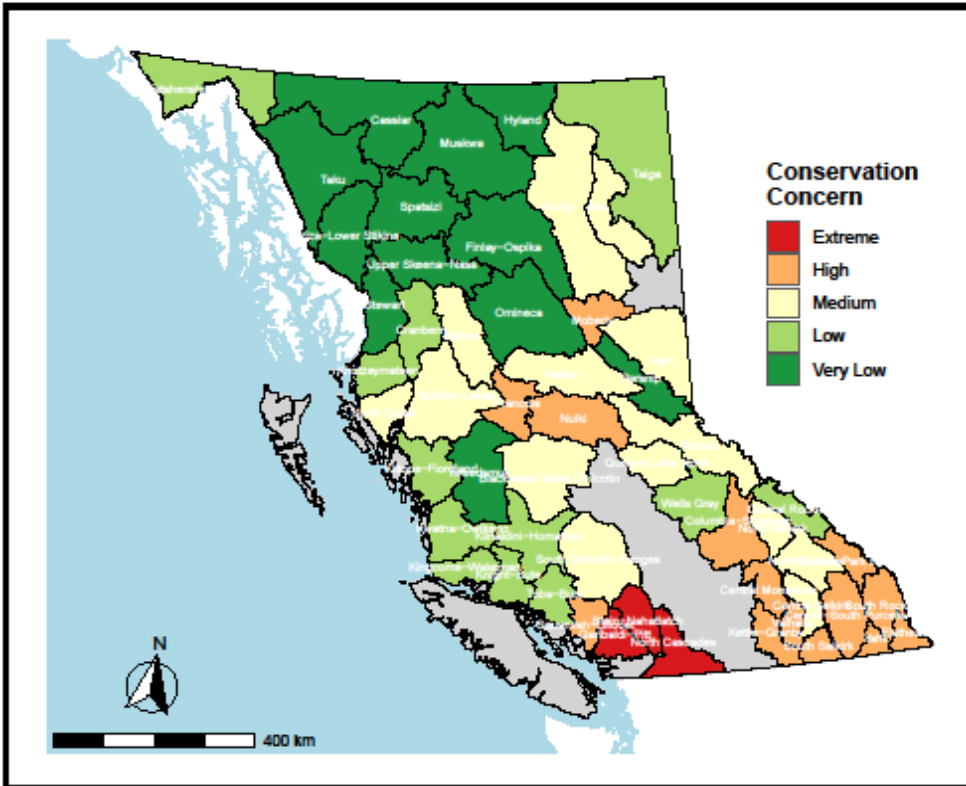


Figure 7. NatureServe Calculator - Conservation concern for all grizzly bear population units in B.C. except those areas that do not currently support a breeding grizzly bear population (grey areas on figure).

Human-caused mortality

Perhaps one of the greatest threats to grizzly bears comes from the killing of bears by people. This may include bears killed during the previous legal hunt (there is currently no licensed grizzly bear hunting in B.C.) or ceremonial hunts, in direct conflict with people, bears killed illegally by people, and bears that are killed in road or rail accidents. There has been gains in reducing this threat, with progress most often realized in areas that have focused conflict reduction programs.

In 1999, an investigation into the causes of mortalities for radio-collared grizzly bears in 13 study areas in the Rocky and Columbia Mountains of Alberta, British Columbia, Montana, Idaho, and Washington found that people killed 77-85% of the grizzly bears known or suspected to have died while collared. In jurisdictions that permitted grizzly bear hunting, legal harvest accounted for 39-44% of the mortalities. Other major causes of mortality included management agency kills of bears that were involved in human-bear conflict, self-defence kills, and poaching. A more recent study, in the Flathead Valley of southeastern B.C., found that for every radio collared bear killed outside of the legal hunt, five others died but were not reported.

Response to grizzly bear-human conflict is a large workload for the B.C. Conservation Officer Service (Figure 8A) and both individual and organizational responses to conflict often create acrimony with the public. The number of calls and hence CO Service workload has been increasing for at least three

decades. The WildSafeBC program was created to educate the public about wildlife conflict and has likely helped to reduce conflict with bears, give the public greater certainty about best practices, and reduce Conservation Officer workloads. The number of bears killed in conflict with people has not increased with the number of calls (Figure 8B), which may be due to changes to conflicts responses by the Conservation Officer Service or the implementation of the WildSafeBC program and other coexistence measures.

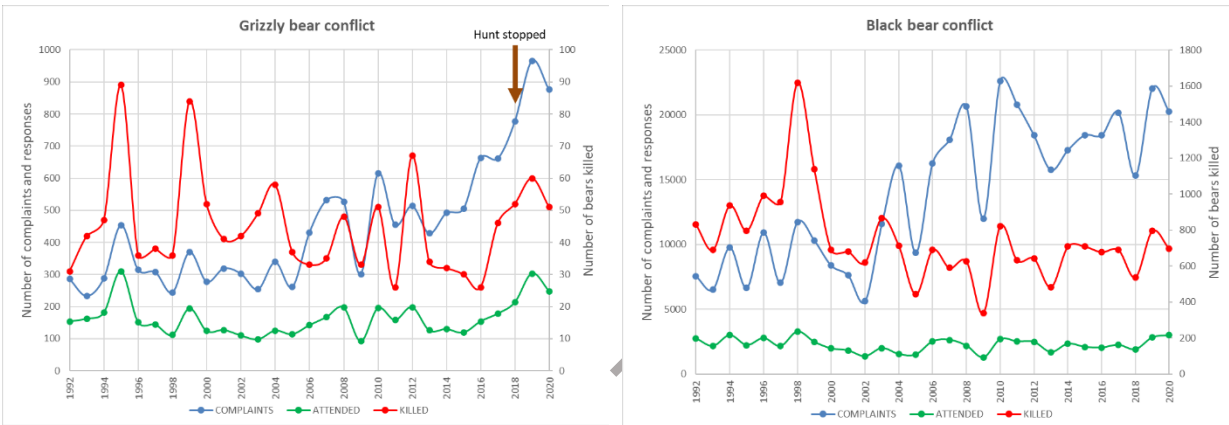


Figure 8. The number of calls per year to the BC Conservation officer service regarding grizzly bear conflicts with people and, the number of bears killed each year in conflict with people for grizzly (A) and black bears (B).

Historically, unregulated hunting and persecution of grizzly bears from the eras of European settlement to the mid 19th century resulted in reductions in grizzly bear abundance and distribution throughout most of North America, including parts of B.C.

Before licensed and regulated hunting of grizzly bears was closed across B.C. in 2017, it is possible that it was a threat to grizzly bears in some areas, but given the conservative rates of harvest, that risk was very low; grizzly bears were hunted under a conservative harvest management procedure from the '80s to 2017, and no declines were attributed to overharvest under regulated hunting.

Threat 1. Residential & commercial development (estimated to be Negligible to Medium among individual GBPU)

Housing, urban developments, and commercial and industrial developments have similar impacts on bear habitat. These developments can result in direct habitat loss and displacement and can reduce survival rates for bears of all ages and can also result in increases to highway traffic/road mortality, outdoor recreation, attractants, and fragmentation of habitats.

Modelling exercises suggest that areas with greater than approximately 6 people per km² no longer support grizzly bears. These impacts are often discussed in concert with cumulative effects on grizzly bears. While habitat loss or displacement from habitat is caused by this threat, direct human-caused mortality resulting from human development is more often documented and hence assumed to be a

bigger threat (see Threat 5). Conservation mitigations for these types of developments include land conservation efforts that retain open space (easements, purchases, and trades) coupled with the implementation of community programs that minimize human-bear conflicts and preventable conflict-related bear mortalities.

Human development can reduce movement among bear populations by creating barriers as described in Threat 4. Crossings can be improved on transportation corridors using fencing and crossing structures such as overpasses and underpasses, but this is not possible in urban and suburban areas. It is usually assumed that the human-caused mortality associated with communities and dwellings increases conservation risks for bear populations and contributes to fragmentation. Land acquisition, subsequent habitat improvements, and programs to minimize human-caused mortality that encourage crossings between communities can be a long-term solution to conserve or improve connectivity between settled areas (see South Selkirk Recovery example below).

Threat 2. Agriculture (estimated to be Negligible or Low for individual GBPUs)

Grizzly bears occasionally kill livestock or depredate crops such as corn or grapes. Crop depredation incidents are currently increasing, and will likely continue to increase in the future, as bears reclaim or are re-introduced into unoccupied areas. The government collaborates with the BC Cattlemen's Association to compensate livestock producers when stock are lost to wild predators (<https://www.cattlemen.bc.ca/lpp.htm>). Wildlife specialists investigate the attack scene to try to learn which species killed the stock and how best to stop this from happening again. The specialist may remove wolves or coyotes that have killed stock but if a grizzly bear kills stock the COS is called. The COS then follows the [Preventing and Responding to Conflicts with Large Carnivores Procedure](#). Government is working towards reducing future conflicts by increasing education, improving animal husbandry practices, and protecting important crops using electric fencing. In future, zoning may be needed to prioritize where grizzly bears conservation is desirable and where it is not.

Agricultural developments can have similar negative impacts as urban, industrial, or recreational developments, resulting in habitat loss or displacement of bears from preferred habitats, and reduced survival rates for bears of all ages. The crops or livestock in these areas also have the potential to attract bears close to people, where bears are subsequently killed because of conflicts (Threat 5). High fences that exclude wildlife from certain fields to reduce crop depredation also exclude grizzly bears from the resources in the field but more importantly, they can disrupt movement among habitats which can reduce population connectivity. Similar to residential and commercial developments, the impact of agricultural developments on grizzly bears has not been considered on its own, but rather as a suite of impacts for cumulative effects assessments, and mitigation measures are similar, requiring programs to retain open spaces, protect livestock from bear attack, and prevent human-bear conflicts.

The Bear Smart and WildSafeBC programs (previously known as Bear Aware) work to minimize conflict between animals and people throughout the province "through collaboration, education and community solutions". Local community programs are available when there are sufficient funds pooled from the province, local municipal and regional governments, First Nations, ENGOs, and regional funding partners

(e.g. Columbia Basin Trust funding supports delivery of the WildSafeBC program throughout the Columbia Basin). Very rural communities such as ranching communities or small, and/or remote, First Nations communities, typically do not have sufficient resources or agreements in place to facilitate local coordinators, and WildSafeBC is financially constrained in what services they are able to provide. There are also several examples of ENGO funded cost-share bear attractant management programs in B.C. that have been effective in reducing human-caused grizzly bear mortality.

Future efforts need to focus on securing funding and developing programs to support all rural residents and giving small communities the capacity to respond to their own conflicts. An example could be providing stable First Nation Guardian funding and training, and increased access to tools and solutions such as electric fencing and bear-resistant infrastructure and solid waste management. There may be an opportunity for government to partner with farmers and ranchers to improve co-existence with large carnivores.

Threat 3. Energy production & mining (estimated to be Negligible or Low for individual GBPUs)

The effects of industrial activities include direct loss of habitat, disturbance of denning areas resulting in abandonment of dens, habitat avoidance, and bears killed in conflict with people. Similar to other human developments, there are only a limited set of studies that examine the stand-alone impact of mines, oil and mineral exploration, and other large scale industrial developments. Displacement from intensive seismic exploration and intensive gas exploration and salvage logging in southeast B.C. far from human settlement was minimal. The impacts of habitat loss and displacement, and reduced survival rates from these developments are felt through cumulative impacts, in consideration with a broader suite of threats that usually includes roads and industrial camps. A key resulting impact from this suite of threats is direct human-caused mortality when bears come into conflict with workers at these sites (Threat 5); however, after decades of industrial activity in one study area (Flathead Valley), none of the almost 200 radio-collared bears were killed at industrial camps, but 32 died in conflict with people elsewhere in the valley and only a few from natural causes. Whether this applies more broadly to other areas of B.C., or whether bears may have died or had poorer health due to displacement from preferred habitats, is unknown.

Oil exploration may impact denning habitat because of the vibrations from explosions and drilling that are then transmitted through the ground, up to and over 1 km away. Observations on numbers, distribution, locations of dens, and responses of grizzly bears to oil exploration disturbances were recorded on Richards Island, Northwest Territories. While bears occupied most of the study area homogenously, they avoided camps. Though no population decline was observed during the three-year period of study, this time frame is very short to measure population trends, and long-term persistence of impacts may cause population declines over time.

Bear populations can be sustained with some industrial activities if those activities are conducted to maintain important habitats, and with properly located camps, incinerated garbage, restricted possession of firearms, and closed motorized access once a project is completed. Some industries employ conflict specialists who work specifically to reduce conflicts with the development and wildlife. Mortality impacts may not be immediate, but, if access (e.g., road networks) remains, the grizzly population remains

vulnerable and may be impacted long after the development is gone (see Threat 4 and Threat 5). Post-development reclamation and access control will likely reduce the long-term effects of mines, but this effect has not been quantified to date.

There are many large reservoirs in B.C. These have eliminated large areas of riparian habitat where bears would have foraged in the past, particularly during spring. Water levels in many reservoirs fluctuate greatly and at low water levels, some bears forage on grasses and forbs that grow in the drawdown zone. Reservoirs on the Columbia River have eliminated anadromous salmon from that system in B.C., which historically was a major food for grizzly bears.

Threat 4. Road and Rail corridors including population connectivity (estimated to be Negligible to Medium for individual GBPUs)

Transportation corridors have a variety of negative implications for grizzly bears. These structures result in habitat loss and displacement of bears as well as direct mortality from collisions with vehicles and trains, particularly with trains where earlier grain spills, or collisions with wildlife has left carcasses, has occurred. Along some highways, bears become habituated to people and even food conditioned which may lead to human-bear conflict and eventually direct human-caused mortality. The combination of these factors along a transportation corridor that crosses entire reaches of occupied bear habitat can lead to fragmentation and population isolation which can significantly influence conservation status. Some bear populations in the southern extent of their range have significant genetic differences reflecting a lack of historic movements across the corridor. Some areas, due to direct conservation efforts thanks to multiple agencies, volunteers, academics, and industry, are becoming less fractured, while other fractures, particularly in the southern Coastal Mountains, remain problematic. Although there has been expansion to the point of reconnection in some south coastal grizzly bear populations, others remain largely isolated. Bears in the North Cascade Mountains of southern B.C., a population with very few individuals, are separated from occupied bear habitat to the northwest by the Fraser River canyon, a major transportation corridor with a large river, settlements, and many other developments. Only one or two male bears are known to have crossed this corridor in the past 3 decades and neither appears to have stayed in the unit. The Stein/Nahatlatch population only contains about 20 bears and these bears have lower genetic diversity than other populations in North America except Kodiak Archipelago. Although some males move to and from this population to the north, females do not.

Forestry and other industrial roads are an integral part of most human developments. A study in the Flathead Valley of B.C. looked at the displacement effect of roads on grizzly bears in an area where bears were hunted, and they found that most bears avoided habitats within 250 m of roads. This equated to a habitat loss of 8.7% within their study area. This was significant because many habitats close to roads contain important bear foods. Avoidance of roads was independent of traffic volume, with even just a few vehicles a day displacing bears, however, in the Parsnip Valley, grizzly bears avoided primary logging roads but not secondary roads. That led to higher mortality for of grizzly bears because use of secondary roads was not predictable. A lot of people travelling them were hunting other species, particularly moose, and grizzly bears were shot as a result of human-bear conflict. Perhaps more importantly, 17 of 21 radio

collared bears that were killed by people and had known mortality locations died within 150 m of a road; all 4 killed further from roads were by legal hunting.

A study in 1996 examined the relationships between grizzly bears, habitat, and roads in the Swan Mountains of Montana. Selection for landscape units declined as road density increased and there was no selection for private lands. Grizzly bear seasonal use of areas within a 500 m buffer surrounding roads was either neutral or positive for buffers surrounding closed roads and roads receiving less than 10 vehicles per day, but bears avoided buffers surrounding roads having greater than 10 vehicles per day. Within the six-year timeframe of the study, eight grizzly bears were killed by humans. All deaths were influenced by road access and unnatural food sources. These deaths were additive to natural mortality and were too many to allow for population growth.

Mitigations for the impacts of roads often requires access planning to reduce the number of open roads, but also their juxtaposition with important bear habitats. In protected areas, more options for managing traffic on roads may exist. For many years, grizzly bears that used roadside corridors in Yellowstone National Park (YNP) were captured and translocated, removed, or hazed away from habitat adjacent to park roads for human safety concerns. This practice reduced the overall amount of habitat available to bears in the park and increased human-caused bear mortality; translocated bears, put into unfamiliar areas with different habitat were often killed after translocation because they got into conflict with people in the areas they were translocated to. Bear managers in YNP reevaluated this approach and implemented management of tourists who were stopped at roadsides viewing bears with no stopping zones, temporary area closures, fencing, vegetation screening, and baiting bears away from roadsides (diversionary feeding). These management actions have increased the overall amount of roadside habitat available for bears and reduced the number of human-caused mortalities. Bear density also increased during this period.

In many parts of B.C., road density has significantly reduced the potential density of bears and, in some areas, to the level that the population is threatened. For more complete treatment of this topic see the Proctor et al. 2019 review of resource roads and grizzly bears which is cited in the Recommended Readings section. The only way to recover some of these impacts is to reduce road traffic or close a portion of the roads, both of which reduce human/bear interaction and disturbance to bears. This must be a large part of grizzly bear recovery and coexistence in some parts of B.C. Currently this requires a detailed planning and consultation process, which can take considerable time. Increases in food on logged or burned areas can be short-lived in some ecosystems, so post-harvest access planning may yield little benefit to bears if the closures happen well after harvest. Pre-harvest access planning can yield better results for bears and is a less arduous process because the fate of the road can be written into the development prescription before the block is harvested. Pre-harvest access planning is the best way to minimize the impact of roads on bears into the future in B.C., however, this should not undermine efforts to close existing roads to improve habitat.

Transportation planning to increase population connectivity has been shown to reduce barriers to movement from highway traffic. There are many structural measures that can be used, and several have been tested in B.C., mostly in national parks. A multi-agency connectivity program is being implemented across Highway 3 in the Rocky Mountains. Many tools exist to analyze habitat connectivity and the maps generated by these analyses can be a starting point for local discussions around mitigation. Implementing crossing structures will require local planning and cooperation among many stakeholders due to the costs involved. Existing transportation structures such as vehicle bridges and drainage culverts can be modified to facilitate wildlife movements, which may offer feasible solutions in some areas.

In addition, planning tools like Land Use Plans can include steps to maintain or improve habitat connectivity such as the Chilcotin Land Use Plan, however it is extremely difficult to evaluate the impact of these measures.

One of the mandates for the Ministry of Forests is to, with support from the Parliamentary Secretary for Environment, lead work with neighbouring jurisdictions to cooperatively develop and invest in new strategies aimed at better protecting our shared wildlife and habitat corridors, including work to implement the *Together for Wildlife* strategy.

Threat 5. Resource use including forestry (estimated to be Negligible to High for individual GBPUs)

Reductions in food

Declines in Pacific salmon stocks will negatively impact grizzly bear survival and reproduction in areas where their ranges overlap. There are correlations between salmon abundance and consumption and grizzly bear litter and body sizes, densities, and cub production; however, the consequences of declining salmon stocks on grizzly bear populations is complicated by regional variations in other food sources and grizzly bear adaptations to natural stochasticity in food resources. Massive declines in salmon returns appeared to cause more grizzly bear conflicts in the Owikeno Lake area of southern B.C. Many of these bears were reported to be in very poor body condition, and some local bears were subsequently killed in conflicts with humans. After the decline in salmon returns, salmon was a smaller part of the diet of bears in Owikeno Lake area than in other places on the mid-coast.

Commercial picking of huckleberries directly competes with grizzly bears for an important food used by bears to gain weight in the fall. Other than some localized commercial berry picking restrictions in parts of the Kootenay region, this practice is largely unregulated in B.C. and the location and abundance of berries that are harvested are currently unknown and hence the impact of this industry is uncertain and likely to vary by area.

Forestry

In B.C., timber harvesting has resulted in a mosaic of seral stages across the landscape. Forest harvesting can, in some ways, resemble the actions of fire on the landscape of fire-dependent ecosystems (mostly in the interior) by removing the conifer canopy and allowing grasses, forbs, and shrubs to grow more rapidly, and sometimes can produce more bear foods. Logging in coastal areas may also produce more bear food however regeneration to young conifer forest is typically faster on the coast than the interior.

There are, however, important considerations for maximizing bear food in logged areas. For example, the cover of preferred bear foods is generally less abundant on logged sites where herbicides or mechanical spacing are applied. Site treatment is at least partially responsible for this differential response.

Scarification destroys the vegetative reproductive organs of many shrubs and summer logging using modern extraction equipment also damages stems, rhizomes and mycorrhizae, delaying the recovery of these shrubs post-logging. Winter logging damages fewer plants and is preferred for sites that already have high cover of a target perennial such as soapberry or huckleberry.

A major difference between burned sites and clearcut sites, is that even if bear foods are initially abundant in clearcuts, conifer regeneration is relatively rapid hence the flush of new food is only available until the regenerated coniferous trees grow to a point that the canopy closes. The result is large areas with predominantly closed canopy, second growth forests that contain very little bear food. The industry has developed many practices to speed up reforestation and shorten the early seral period which is the stage that generates the most food for bears.

In conclusion, habitat quantity can potentially be improved by logging, but open roads left behind can negate the potential benefits. Potential benefits can also be short-lived so spacing new logging frequently across the landscape will create a mosaic of new habitat for bears better than large amounts of logging following by decades of no activity. The impact of forestry on bears at a landscape scale is likely dependent on whether natural disturbance regimes are still in place, with landscapes without natural disturbance regimes, such as coastal wet forests, benefiting disproportionality from foods created by logging, while bears in systems that are dominated by natural disturbance may benefit less, or even be harmed, from logging. Habitat quality can be improved by using logging practices that damage perennials less such as winter logging or selective cutting. Any practice that lengthens the early seral period such as delays in planting, reduced stocking densities, planting slower growing or mixed species, and reduced or eliminated use of herbicides or juvenile spacing will allow greater development of annual herbs and grasses and perennial shrubs and lead to more grizzly bear food. Pro-active approaches to forestry such as cultural burning that encourage these measures will benefit bears. Screening cover between roads and logged areas will allow greater use of forest openings by many different animal species. Wildlife friendly logging practices can increase the number of prey species such as moose and thus benefit grizzly bears. In many parts of the province, silvicultural prescriptions that will increase the amount of bear food on a block post-harvest could be implemented, although there may be increases to delivered wood costs or the free-to-grow period.

Threat 6. Human intrusions & disturbance including commercial and non-commercial back-country recreation (estimated to be Negligible or Low for individual GBPUs)

British Columbia has desirable landscapes that will likely see increased outdoor recreation. Recreational developments can negatively affect bears because recreation areas are often in good habitat for bears. Back-country recreation is increasing markedly throughout B.C. and associated developments need to be considered carefully to minimize impacts on bears and other wildlife. Local knowledge can inform permitting decisions as well as tools that map important habitats. Regional or local cumulative effects analyses have often summarized locally available data to support decision making. The Elk Valley

Cumulative Effects Management Framework² and the Skeena Environmental Stewardship Initiative³ are examples of this.

Qualitative models suggest that when the number of people increases to over 100 per day, the displacement effect on bears is high. Displacement effects can alter daily activities, including reductions to calorie intake. Grizzly bear feeding behavior on aggregations of adult army cutworm moths (*Euxoa auxiliaris*) in the alpine of Glacier National Park, Montana, was studied with respect to recreational climbers. When bears detected climbers, a substantive reduction in energy intake occurred because they spent 53% less time foraging on moths, 52% more time moving within the foraging area, and 23% more time behaving aggressively. Although bear viewing is characterized as a non-consumptive recreational activity, negative impacts of viewing activities on bears have been well documented, particularly in B.C., Alaska, and Yukon. Spatial, temporal, and behavioral changes to bear feeding activities can occur because of human presence for the purpose of viewing.

The degree of displacement caused by human activity can vary depending on the availability of cover and the type of activity. Reactions of grizzly bears to human activities in southeastern B.C. and northern Montana using radiotelemetry have been studied. Bears responded more strongly to ground-based human activities, such as people on foot or in moving vehicles, when in the open than when in cover. Cover had less effect on their response to fixed-wing aircraft. Bears generally displayed stronger reactions to human activities, other than to people on foot, that occurred less than 76 m away. The strongest response of bears was to people on foot, and these reactions were most extreme in areas of very low human use. A camera-based study in southwest B.C. found that faster moving vehicles such as motorized vehicles and mountain bikes caused greater grizzly bear displacement than slower vehicles such as horseback riders and hikers.

Increasing demand for backcountry recreation opportunities during winter (e.g., snowshoeing, helicopter-assisted skiing, and snowmobiling) in steep, high elevation terrain has elevated concern about disturbance to grizzly bears denning on the Kenai Peninsula, Alaska. To help identify areas where such conflicts might occur, a spatial model was developed to predict potential den habitat. In comparing the areas of highest probability of providing den habitat with patterns of snowmobile and non-motorized recreation, the authors found limited overlap between the two recreation activities and potential den habitat. At the landscape scale, however, backcountry skiing overlapped more with high-quality den habitat than did snowmobiling. Research on the impacts of recreation on denning is limited.

If important foraging, denning, or security areas are spatially identified, human activities can be routed in areas that are less likely to be used by bears. Alternatively, access can be limited during periods that bears are using the area.

² www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/cumulative-effects-framework/regional-assessments/kootenay-boundary/elk-valley-cemf

³ <https://data.skeenasalmon.info/dataset/ssaf-state-of-value-report-for-grizzly-bear-2020/resource/12245066-ef58-4636-aa6e-27388071d42b>

Threat 7. Natural events such as wildfires (estimated to be Negligible threat)

There is strong evidence that wildfires and some fire management practices such as prescribed burning or understory fuel removal improve grizzly bear habitat. The importance of fire in maintaining food resources that grizzly bears need, with optimum food availability at the early-seral, shrub-dominated phase of stand development has been long understood. Grizzly bears strongly select for open burned habitat where huckleberry (*Vaccinium sp.*), one of their major summer food, was plentiful. Reproductive rates were partially determined by huckleberry production and the abundance of these fruit in burned areas was thought to be the underlying cause of a much higher density of bears in an industrially developed portion of the Flathead Valley (southwestern BC) compared to the adjacent, protected part of the valley that had no major berry fields. In Southeastern BC, huckleberry abundance was related to habitat selection, female survival, and reproductive success and, in Scandinavia, bilberry (*Vaccinium myrtillus*) and lingonberry (*V. vitis-idaea*) abundance also had a strong influence on habitat selection and female reproductive success.

Due to increasing fuel abundance, wildfire suppression has been a major factor affecting natural fire regimes resulting in fewer but, when combined with changing climate, more intense fires. The implications of this novel fire regime on grizzly bears are uncertain but are likely beneficial. The large fires in the hot, dry 1930s, created huckleberry fields that were used by bears for many decades in the Flathead valley.

Threat 8. Diseases (estimated to be Negligible threat)

Salmon Poisoning Disease (SPD) is caused by a rickettsial organism (*Neorickettsia helminthoeca*) and is found in freshwater systems on Vancouver Island and other locations in the Pacific Northwest and is well recognized to cause morbidity and mortality in domestic dogs. This parasite is documented to also affect bears and has been identified as a recent concern with identifying source populations for grizzly bear reintroduction in the North Cascade ecosystem. The potential implications to grizzly bear populations are that animals from areas that are not endemic for this parasite may be much more susceptible to its effects with potential mortality. A genetic resistance is suspected but not yet confirmed. Research also needs to be conducted to develop SPD surveillance techniques specific to bears.

Researchers examined the gastrointestinal tracts of grizzly bears from populations of Alberta and B.C. Specimens were examined for helminths (parasitic worms), which were identified to the species level. They found seven parasite taxa: *Dirofilaria ursi*, *Baylisascaris transfuga*, *Uncinaria rauschi*, *U. yukonensis*, *Taenia arctos*, *Diphyllobothrium dendriticum*, and *D. nihonkaiense*. They also documented the first report of tapeworms *D. dendriticum* and *D. nihonkaiense* in North American bears. While individual parasite loads were high in some individuals, the research methods did not allow for documentation of population level effects.

Recently, hepatic sarcocystosis caused by an unknown *Sarcocystis* spp. was identified as a syndrome in black and young grizzly bears in B.C. The life cycle of this parasite in bears is not known, but there appears to be the potential for the infection to be fatal in all species of bears. Intramuscular sarcocysts are a

common finding in many species, but are typically quite uncommon in bears, generally affecting less than 2% of bears in the United States.

Hepatitis and encephalitis (inflammation of the liver and brain) associated with *Sarcocystis* was likely the cause of death in three yearlings, as well as the cause of aggressive behaviour of a single aged black bear female, in study on Vancouver Island. Three other bears that died of other causes (e.g., euthanized, shot, or electrocution) also had multifocal necrotizing hepatitis associated with *Sarcocystis* spp., which may have affected their general health and/or predisposed them to trauma. Grizzly bears may respond to *Sarcocystis* infection the same way black bears do given their close evolutionary relationship. Analysis to further characterize the *Sarcocystis* spp. infecting bears and its cohort-specific impacts with a full understanding of this parasite's life cycle needs to be carried out.

Other infectious diseases such as avian influenza, rabies, trichinella, canine distemper, canine hepatitis, and demodectic mange can affect bears but either are not identified or have not caused significant population or conservation concerns to-date in B.C. or elsewhere. However, except for measuring body condition, survival, and reproduction during studies where bears are captured and handled, there have been no standardized efforts to assess grizzly bear health in BC or many other parts of North America. The impact of parasites on the health of bears is still poorly understood and the integration of parasitic disease surveillance into wildlife management and conservation programs is limited. In the last decade, habitat loss and fragmentation promoted disease emergence and mortality in giant pandas (*Ailuropoda melanoleuca*), parasitized by the intestinal nematode, *Baylisascaris schroederi*. This example demonstrates how progressive habitat fragmentation in the southern portion of grizzly bear range may not only increase positive density-dependent effects on pathogen transmission, spread, and persistence but may also influence bear health through other stress mediated mechanisms. While density-dependent effects of disease are likely, population level effects have not been seen in grizzly bears in B.C.

Threat 9. Pollution (estimated to be Negligible threat)

While some grizzly bears rely entirely on terrestrial foods, others focus on returning spawning salmon (*Oncorhynchus* spp.) in late summer. Salmon are a potential source of bioaccumulation of persistent organic pollutants (POPs). POPs resist breakdown, store easily in fat, and bioaccumulate through the food chain. POP concentrations and patterns measured in grizzly bears feeding on fish in coastal BC were high. While bears consuming a higher proportion of terrestrial vegetation exhibited POP patterns dominated by the more volatile organochlorine (OC) pesticides and the heavier polybrominated diphenyl ethers (PBDEs), bears consuming salmon were dominated by the more bioaccumulative POPs (e.g., DDT, chlordanes, and BDE-47). The ocean-salmon-bear pathway is via atmospheric contaminant transport, deposition into the marine environment, uptake into marine biota, accumulation through the food web, and retention in the bear tissues. Christensen et al. (2005) estimate that salmon deliver 70% of all OC pesticides, up to 85% of the lower brominated PBDE congeners, and 90% of polychlorinated biphenyls (PCBs) found in salmon-eating grizzly bears, thereby inextricably linking these terrestrial predators to contaminants from the North Pacific Ocean.

PCBs and other POPs have potential long term health impacts for bears. They can mimic, block, or disrupt the function of naturally occurring hormones in both humans and wildlife, and have been implicated as a causative factor in cancer, embryonic malformation, sterility, growth retardation, immunologic dysfunction, and reproductive abnormalities. In controlled studies of laboratory mammals, organochlorines including the pesticide DDT and the PCBs have caused changes in bone composition including reduced bone mineral density. Organochlorines have also been implicated in other bone diseases including periodontitis, a degenerative condition of tissues and bones surrounding the teeth. However, these effects have not been described or observed in wild bears.

Threat 10. Climate change & severe weather (estimated to be Negligible or Low for individual GBPUs)

Generalist species typically respond better to environmental change than species with a more limited niche. Correspondingly, grizzly bears may be more resilient to some effects of climate change than other species. The effects climate change may have on grizzly bears relate to increased stochasticity in the availability of food resources. Whitebark pine (*Pinus albicaulis*) seed production, for example, which occurs throughout the southern portion of grizzly bear range in the United States and B.C., is often cited as an important food resource and will likely suffer from climate change impacts. Historically limited by low winter temperatures at high elevations, recent beetle outbreaks facilitated by warmer temperatures have caused high mortality throughout the species range, leading the listing of Whitebark pine as Endangered in Canada.

Predicting the trophic and food web effects of climate change on bears are complicated by the diversity of foraging strategies bears use. For instance, in Alaska, grizzly bears have reduced their consumption of salmon in favour of red elderberries (*Sambucus racemose*) on parts of Kodiak Island. Elderberries have less protein than salmon but are more digestible and convert to body fat faster. Warmer spring temperatures cause berries to ripen earlier than usual, resulting in this food resource being available at the same time as sockeye salmon (*Oncorhynchus nerka*). In years with earlier springs, bears departed salmon spawning streams to forage on berries on adjacent hillsides. However, once bears are done foraging on berries, salmon runs were largely finished. In years with later springs, bears can capitalize on both food sources by eating berries after the sockeye runs have finished. On average, red elderberries are ripening two and a half days earlier every decade, suggesting berry ripening will regularly overlap with the salmon run by 2070. It is uncertain how this phenological shift will impact grizzly bear populations.

The effect of climate change on bear foods is likely to be diverse and will vary greatly across the province and among foods. For example, climate change is presenting unprecedented environmental conditions for salmon populations across B.C.'s coast and it is predicted that salmon productivity will be challenged by diminished water flows and increased in-river and marine water temperatures. Denning periods will shorten but the impact this may have on bear populations is uncertain although it is suspected human-bear conflicts may increase as a result. An additional threat of climate change on grizzly bears will be the movement of people from more southern, hotter parts of the world towards more northern locations, such as B.C.

7 CURRENT STEWARDSHIP APPROACH

The provincial framework of grizzly bear stewardship integrates population and habitat decisions and support tools and is implemented through legislation and the natural resource management system. Regulatory and policy mechanisms exist with the Forest and Ranges Practices Act (FRPA), Oil and Gas Activities Act (OGAA), B.C. *Wildlife Act*, the *Land Act*, *Park Act* (Park, Conservancy and Recreation Area Regulation), *Environmental Assessment Act*, *Environment and Land Use Act*, and various land use orders and regulations. Policy mechanisms include, but aren't limited to, the Interim Cumulative Effects Policy, Environmental Mitigation Policy, Identified Wildlife Management Strategies, and Land Use Plans and planning guides and Protected Area Management Plans. Collectively these provincial tools, some of which have been co-developed with First Nations are intended to ensure the stewardship and protection of grizzly bears and their habitats.

This document is not intended to capture the many Indigenous customs or practices specific to the stewardship of grizzly bear, nor the food, social, and ceremonial harvest rights that are diverse among First Nations. That said, various existing and emerging government-to-government agreements such as those associated with the Great Bear Rainforest in the Pacific North Coast contain specific content related to grizzly bear assessment and management. Treaties also include wildlife chapters that supports joint management of wildlife.

On October 24, 2017, the Office of the Auditor General conducted "[An Independent Audit of Grizzly Bear Management](#)" for B.C. This comprehensive review contained ten recommendations to improve on the management of this species, which the Provincial government accepted. Following the audit, the Ministry of Forests submitted a Detailed Action Plan to the Select Standing Committee of Public Accounts that outlines how the recommendations from the audit will be acted upon. The Detailed Action Plan is updated and submitted annually to demonstrate progress made in implementing the recommendations. This continued review and transparency is expected to continuously improve the stewardship approach and outcomes for grizzly bear (and other wildlife and habitat values).

7.1 Habitat Management

Legislation, Tools, and Special Habitat Protection

1) FRPA and OGAA

The main framework for the conservation of grizzly bear habitat resides under the Identified Wildlife Management Strategy (IWMS; MoE 2004) in FRPA. Grizzly bears are designated as a species at risk under FRPA and OGAA and fall within the special habitat protections authorized under the Government Actions Regulation (GAR) and the Environmental Protection Management Regulation (EPMR). The Grizzly Bear Species Accounts and Measures IWMS provides direction, policy, procedures, and guidelines to manage the conservation of important ecological features and habitats for species at risk. Under the authority of GAR/EPMR, the Province can invoke habitat protection measures to designate Wildlife Habitat Areas (WHAs) or specified areas, or issue ministerial orders to establish WHAs that identify specific locations and, under GAR, prescribe forest and range practices within those areas. WHAs have been established throughout the province (See Figure 9. Grizzly Bear Wildlife Habitat Areas and Specified Areas) to protect a variety of special habitats including avalanche chutes, riparian forests, wetlands, as well as forests that provide thermal and visual cover.

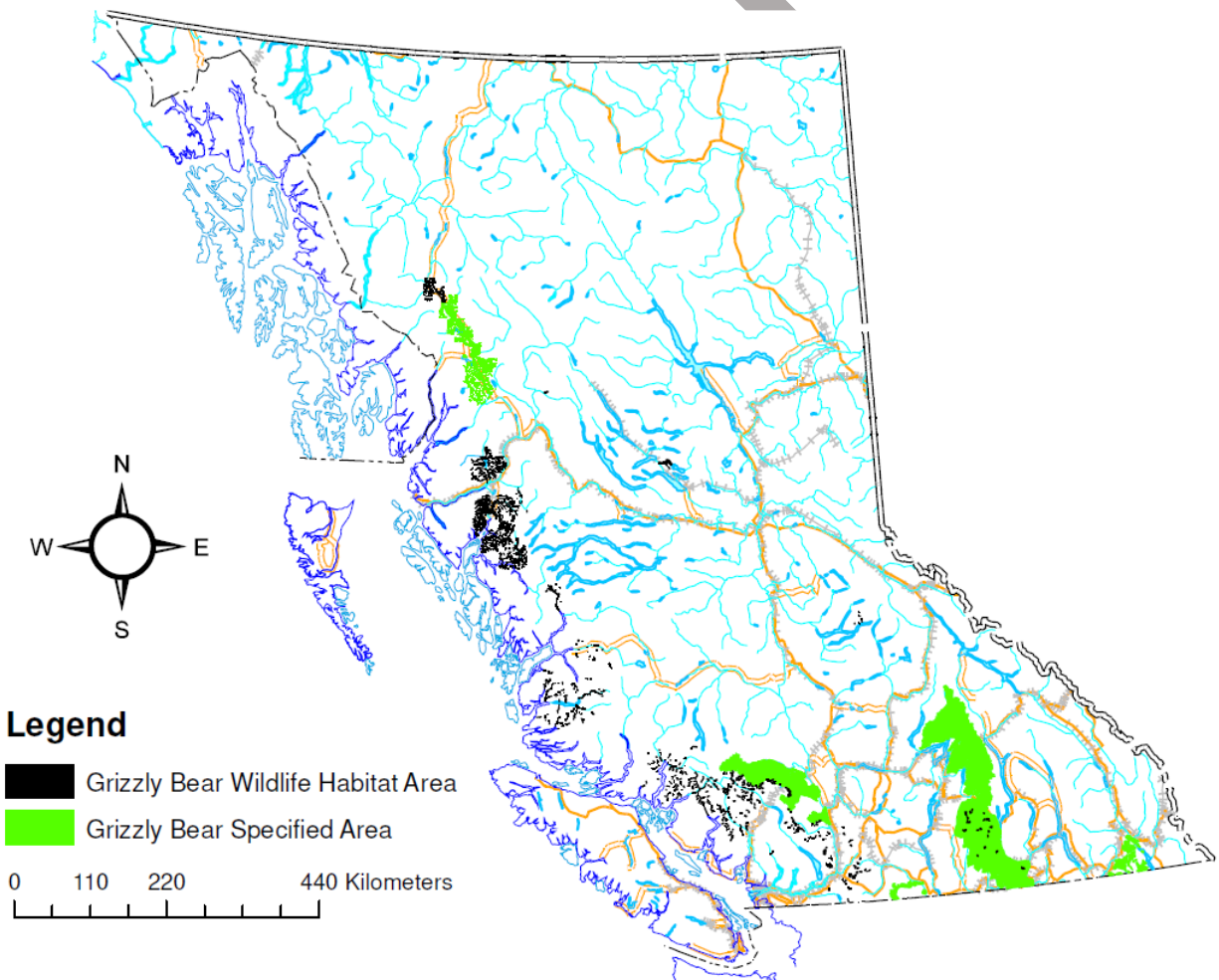


Figure 9. Grizzly Bear Wildlife Habitat Areas and Specified Areas

2) B.C. Wildlife Act

The B.C. *Wildlife Act* can be divided into legislation and regulations. The legislative component of the act has prohibitions on specific activities that people can do in relation to wildlife, and the regulatory component provides tools that support the overall intent of the act.

Legislation under the *Wildlife Act*, specific to grizzly bears, include prohibitions on possession, transport, export, killing, hunting, feeding, or attracting bears. There is also some authority in the act to protect wildlife habitat through Wildlife Management Areas (WMAs), where the alteration, destruction, or damaging of wildlife habitat in a manner that is harmful to wildlife or wildlife habitat is prohibited. However, WMAs are currently not commonly used as a tool to protect grizzly bear habitat. Exemptions to all of these prohibitions, for example to allow for protection of private property or wildlife rehabilitation facilities, are available either through regulation or permits.

Regulatory tools under the *Wildlife Act* that relate to grizzly bear population stewardship include hunting regulations (there is no open season on any wildlife in B.C. unless one is designated in regulation) and motorized vehicle prohibitions/restrictions (i.e., access management) to protect habitat, minimize displacement, or reduce the potential for interaction between humans and grizzly bears. The Conservation Officer Service has the authority to enforce many of these tools including decisions regarding public safety.

WMAs empowered under the *Wildlife Act* can be designated on land and extend onto private lands under lease to the Ministry (FOR). None are specifically designated for grizzly bear, but several recognize grizzly bear habitat as one of several natural values, e.g., Tagin and Columbia Wetlands.

The *Wildlife Act* also has laws that prohibit people from intentionally feeding grizzly bears or attracting grizzly bears to any place where there are likely to be people. These laws are in place for the protection of both humans and grizzly bears; grizzly bears that become food conditioned and habituated to humans pose a safety risk to humans and to themselves. If a conservation officer believes on reasonable grounds that the existence or location of an attractant in, on, or about any land or premises, other than in a private dwelling, poses a risk to the safety of any person because the attractant is attracting or could attract dangerous wildlife to the land or premises, the conservation officer may issue a Dangerous Wildlife Protection Order directing an owner, occupier or person in charge of that land or premises to contain, move, or remove the attractant within a reasonable period as specified in the order.

3) Land Act

The *Land Act* has provisions to limit human use which could be used to protect bears and bear habitat. An order was recently enacted in the Kootenays to close certain areas to commercial huckleberry picking to reserve the resource for bears and non-commercial pickers. The Land Use Orders Regulation have also been used to establish objectives for protection and stewardship of grizzly bear habitat (e.g., the Great Bear Rainforest Land Use Order) for the purposes of the *Forest and Range Practices Act*. Other sections can be used to identify important habitat values in the authorization process so that decision makers may

add conditions to permits if activities are authorized. These notices are typically managed as either administered or non-administered lands under the Conservation Lands Program.

4) Park Act

The *Park Act* contains provisions for much greater limitations to human behaviour, attractant management, commercial activity, and restrictions on human access to protect animals but these provisions only apply in provincial parks and protected areas. Other designations contribute to the protection of grizzly bear habitat throughout the province. The parks and protected areas of B.C. include 15.4% of the province, protecting many important areas for grizzly bears due to their size and in some instances remote location, for example, conservancies in the watershed of the Khutzeymateen River were designated to protect provincially important grizzly bear habitat.

5) Land Use Planning

During the 1990s, the Province embarked on an ambitious land use planning exercise under the Commission on Resources and Environment (CORE) review. The development of Land and Resource Management Plans (LRMPs) divided the province into subunits and laid the foundation for the establishment of new protected areas and/or special resource management zones for sensitive species. The plans also often contained general measures about habitat stewardship that applied to the entire planning area. Further, higher level plans adopted under the LRMP process were legally adopted under the *Land Act*. This foundational exercise provided the higher-level planning and direction that supports habitat protection carried out since 2004 under FRPA and OGAA. The extensive network of WHAs in the Sea to Sky area and in the Kalum Forest District, motor vehicle prohibitions/restrictions in the Sea to Sky and Lillooet LRMPs, and Grizzly Bear Management Areas in the North and Central Coast can be traced back to LRMP direction and commitments made during the CORE review. Additionally, GAR orders covering large Specified Areas in the southern interior (the Okanagan-Shuswap and the Kettle-Granby) are a result of land use planning initiatives.

Several of the last LRMPs to be completed in B.C., notably the Central Coast, North Coast and Haida Gwaii LRMPs, were conducted on a government-to-government basis. The processes were co-chaired by provincial and First Nation representatives. Recommendations from the LRMP tables informed subsequent government-to-government discussions to develop collaborative land use agreements. Co-developed land use regulations such as the Great Bear Rainforest Order identify objectives for grizzly bears including the protection of dens and high-class habitat values (e.g. spring and summer forage habitat). The order also protects aquatic habitat, which helps protect grizzly bear access to fish and riparian habitat, and it protects large tracks of forest as landscape reserve which provides forest cover and connectivity.

6) Cumulative Effects Framework

Cumulative effects (CE) assessments for grizzly bears have been completed or are in progress throughout the province under the provincial [Cumulative Effects Framework](#). These assessments evaluate the current state of, and risks to grizzly bears and their habitats, through several indicators (e.g. road density and

available core secure habitat). The reporting on these assessments also identifies potential mitigation measures to address those risks. Assessment reports for grizzly bear can be accessed on the [CEF website](#). These assessments can inform strategic, tactical, and operational decisions related to stewardship of grizzly bear. However, in several regions, Local Ecological Knowledge (LEK) was not incorporated and accordingly, results from this framework may change if this information is integrated in line with the *Together for Wildlife Strategy* and *DRIPA*. Guidance has been developed to assist natural resource staff and decision makers in applying the grizzly bear CE assessments in those decisions. Several projects are currently implementing mitigation measures in response to cumulative effects assessments which are often related to access management.

7) Allowable Annual Cut Determination

In B.C., under Section 8 of the *Forest Act*, timber supply (i.e., allowable annual cut measured in m³ of wood volume, AAC) is determined within timber supply units (i.e., timber supply areas or tree farm license areas) at least once every 10 years. The Chief Forester determines the allowable annual cut through a timber supply review process. Related to grizzly bear management, the *Forest Act* establishes that the Chief Forester must consider “*the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production*” and “*the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia.*” Objectives for grizzly bears may be established through Land Use Objective Regulation orders, notices made through the Forest Planning and Practices Region, or the Government Actions Regulation. Thus, as part of the process, there is consideration of how these habitat objectives for grizzly bears should influence timber harvest. But there is considerable debate about the effectiveness of these processes and two Forest Practice’s Board reviews found the management of roads and the enforcement of Government Action Regulations did not meet the intent of the current regulation or policy. In addition, the determination of AAC may impact the rights of First Nations so government is obligated to consult on the decision, and in some cases, grizzly bears are identified as species of cultural, social, and economic importance. Consideration of grizzly bears has been a component of some recent timber supply reviews^{4,5} although it is not clear that adequate systems are in place to manage road density or protect bear habitat.

The Forest Analysis and Inventory Branch is responsible for completing analyses for timber supply reviews. Analysts in the Branch have and continue to integrate indicators of grizzly bear habitat with forest harvest and timber supply analyses to simulate future habitat ‘supply’ under current alternative

⁴ https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/prince_george_tsa_rationale_2017.pdf

⁵ https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/arrow_tsa_rationale_2017.pdf

forest management regimes (e.g.,^{6,7}). Similarly, analysts are investigating how the tree harvest method, post-harvest block treatment, planting density and species, and stand tending affect grizzly bear habitat. These relationships may be incorporated into forest development planning using new models and existing tools to assess trade-offs between timber and grizzly bear habitat supply under different forest management scenarios. For example, these tools could be used to support the development of local or regional grizzly bear stewardship plans that could then inform timber supply determinations.

8) Referral Process

When authorizations are considered under any of the above noted legislations, the supporting policy and information received through consultations may result in the addition of enforceable considerations or expectations applied to permits. Conditions further mitigate the potential impact of negative effects. The Environmental Mitigation Policy guides the general approach to this referral process. Guidance, specific to grizzly bear, is also made available to proponents during the application process.

10) First Nation Engagement Processes

Several individual First Nations, or groups of First Nations, have negotiated government-to-government agreements with the province, variously referred to as 'Reconciliation Protocols', 'Engagement Frameworks' or 'Strategic Engagement Agreements' that establish new forms of 'shared decision making.' These agreements are each uniquely tailored to match local circumstances but share common features, including a commitment to work together in a spirit of mutual respect, and to make sincere efforts to achieve progress toward reconciliation.

These agreements do not resolve all of the uncertainty related to land use in B.C., nor do they attempt to resolve the underlying questions of jurisdiction. What they do provide is a framework for collaboration between two governments which, despite their differences, seek to build working relationships with one another, develop trust, and find ways to reach mutually agreeable decisions about how land and resources should be managed.

Reconciliation and Engagement Agreements establish collaborative government-to-government processes for information sharing, adjudication and decision making on Applications for Land and Resource Decisions under relevant legislation whether a decision has been requested by a non-governmental Applicant (e.g., approval of a *Land Act* tenure or park use permit) or a decision is being proposed by a provincial Agency (e.g., a hunting regulation change). Through these processes, provincial Agency and Applicable First Nation Representatives typically share information and review and discuss relevant issues and interests with the goal of reaching consensus on recommendations for a Decision. Final recommendations, consensus or otherwise, are provided to provincial Agency and Applicable First Nation Decision Makers, who then consider the recommendations and make decisions as per their own laws, policies, and customs.

⁶ https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/wildlife-analysis/pg_grizzly_bear_popn_model_report_20161027.pdf

⁷ https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/wildlife-analysis/pg_grizzly_bear_popn_model_report_20161027.pdf

8 STEWARDSHIP FRAMEWORK GOALS

The goals of this provincial grizzly bear stewardship framework are to:

1. Summarize existing data to be used as a guide to advise on methods, research, data, approaches, and tools available to regional or local communities to fill knowledge gaps to increase the potential to realize locally desired outcomes for grizzly bears and their habitat.
2. Provide an adaptive approach that seeks to ensure the coexistence of healthy, fully functioning ecosystems and human communities (Ecosystem Based Management) for the co-development of regional or local grizzly bear stewardship plans based on western science and Indigenous knowledge. These plans will consider multi species relationships and cumulative effects of industrial activities, other human activities, and natural processes on grizzly bear conservation.
3. Support reconciliation with Indigenous Peoples through collaboration and partnership directed towards co-governance and joint, collaborative or consent-based decision making on initiatives related to grizzly bear conservation, management of human activities, and ecosystem-based stewardship.
4. Promote safe and respectful co-existence between grizzly bears and people.
5. Inform, educate, and be transparent and open about grizzly bear stewardship in British Columbia to the public, Indigenous governments, and legislators.
6. Columbia to the public, Indigenous governments, and legislators.

9 APPROACHES TO MEET STEWARDSHIP GOALS

9.1 Recommended Stewardship Actions

Grizzly bears are one of most intensively managed wildlife species in B.C. Stewardship activities are required to reduce human-caused mortality (e.g., rail and road mortality), reduce conflicts with humans, and ensure community safety, as well as habitat protection and enhancement, and population recovery in certain areas of the province. Further, effective conservation in B.C. has important implications to the species status at the federal and level given the western population of grizzly bear is listed as a species of special concern under the *Species at Risk Act*, and internationally given grizzly bear populations that connect across the U.S. and B.C. border.

For additional information on steps, actions, resources and tools to meet stewardship objectives see “Appendix B: Approaches to meet Grizzly Bear Stewardship Objectives”.

9.2 Tracking of human caused grizzly bear mortality

All bears that are killed by a person (e.g., killed for self defence, by an officer in response to conflict, road/rail, or by accident) must be inspected by a government agent and this inspection involves the collection of numerous pieces of data including location, size, sex, age and cause of death. Tracking causes of mortality can inform solutions to minimize these events. This dataset began in 1976 and has

been used in management decision-making and research. Similarly, much inventory information has been collected for grizzly bears in B.C. and this information has been used to extrapolate abundance throughout the province using two statistical models. Several population monitoring efforts are on-going across the province and are described below.

It is recommended that the Province continue to record human caused mortality of grizzly bears throughout the province and use those data to inform stewardship actions. Human caused mortalities include hunter kill (pre 2017), animal control, illegal kill, road mortality, and rail mortality. Recorded grizzly bear mortality records can be found at <https://catalogue.data.gov.bc.ca/dataset/4bc13aa2-80c9-441b-8f46-0b9574109b93>. Failure to promptly report to an officer the killing or wounding of wildlife, either by accident or for the protection of life or property, can come with a \$115 fine. Failure to comply with the requirements to have human caused mortality of grizzly bears inspected can result in a \$230 fine. Both of these offences, if subject on conviction, can result in a fine of note more than \$50,000 or to a term of imprisonment not exceeding 6 months, or both.

9.3 Local Planning

One of the purposes of this Grizzly Bear Stewardship framework is to encourage, support, and provide guidance to local or regional level plans (“local” plans) and grizzly bear stewardship initiatives. Other than a desire to reduce human-bear conflict, there is no “one size fits all” approach to grizzly bear stewardship province wide. Grizzly bear life history, habitats, threats, communities, and people are too diverse. Local level planning is intended to address the specific biological and conservation requirements of grizzly bear populations and their habitat and cater to the unique needs of the communities that are most likely to benefit from, or be impacted by, grizzly bear stewardship initiatives. Plans should be developed with the best scientific information as well as information and knowledge from applicable local Indigenous communities. Consent from Indigenous groups should be meaningfully sought in order to finalize any local plans.

Local grizzly bear plans should be initiated by Provincial and Regional Wildlife Program staff and First Nations whose territories overlap with the plan area and be informed by interest groups and communities in the area where appropriate. Together for Wildlife has an initiative to establish Regional Wildlife Advisory Teams that represent a broad spectrum of wildlife interests and is meant to provide recommendations to government on wildlife stewardship initiatives, these teams, once established, should also be included in regional grizzly bear plans.

Planning teams should include relevant ministry staff as applicable (i.e. BC Parks), interested parties such as industry, environmental organizations, independent biologists, and other stakeholders. Local governments and members of the CO Service may also like to participate. A local plan could be as simple as a few population and habitat objectives to something as detailed as a recovery plan or a State of Value report. We encourage all planning teams to consider topics such as:

- The accuracy and uncertainty of grizzly bear population size, distribution, and the current GBPU boundaries.
- Current Threat class and the appropriateness of the current assignment.
- Current threats to grizzly bear food and habitat security.
- Human-caused mortality and the need to reduce it.
- Human-caused disturbance and the need to reduce it.
- Road density and human use of the landscape as it relates to all of the points above.
- Threats to inter-population connectivity be considered and addressed where appropriate.
- Protection of wildlife features, including winter dens, summer/fall hyperphagia forage sites, interpopulation connectivity habitat, and source populations.
- Inventory, monitoring, and research needs.
- Local Indigenous knowledge regarding the status of local grizzly bear populations.
- The relationships between local Indigenous peoples and grizzly bear populations.
- Safety concerns for rural and remote communities.
- Local Indigenous rights, interests, and values with respect to grizzly bears.
- Ways to mitigate the threats identified above and a work plan to implement these measures that includes all affected parties.
- Planning teams are encouraged to consider existing cumulative effects assessments for grizzly bear in the area of interest, which can be accessed from the provincial CEF website. These assessments provide information related to the topics listed above, but it should be recognized that they may not incorporate Local Ecological Knowledge.

We also would encourage local teams to review baseline data (e.g., conflict rates, mortality rates, population size) with which to compare to similar data collected after management actions have been applied to assess the efficacy of their program.

In addition to existing reconciliation and engagement agreements and associated government to government processes, the Province can consider entering into shared decision making agreements with First Nations, or groups of First Nations under s.7 of the Declaration Act, for a defined geographical area,

In the Central and North Coast of B.C., an area now known as the Great Bear Rainforest or “GBR”, a unique set of arrangements for the protection and stewardship of Grizzly bears has emerged. In part because of the First Nations’ cultural and spiritual connections with bears. But also because of the successful collaboration between First Nations and the B.C. government. See Appendix A: Grizzly Bear Management in the Great Bear Rainforest, for more information.

Previous Land Use Planning and Land and Resource Management Planning (LRMP) recommendations (<https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning>) have led to laws that protect grizzly bears or their habitat. For example:

- The Sea to Sky and Lillooet LRMPs resulted in seasonal motor vehicle prohibitions to reduce disturbance and displacement of grizzly bears within important habitats such as south facing avalanche chutes or important berry patches.
- In 2009, the Kalum, North Coast, and Central Coast LRMPs resulted in the closure of the grizzly bear hunt in the Nass-Skeena, Khutze-Kitlope-Kimsquit Upper Dean-Tweedsmuir, and Ahnuhati Grizzly Bear Management Areas.
- In 2019 a number of areas were closed to commercial huckleberry picking in the Kootenay Region to ensure grizzly bears and local pickers had enough berries for their needs.

9.4 Inter-jurisdictional Planning

Grizzly bears are sometimes managed for different goals in neighbouring jurisdictions. B.C. and its neighbours continue to benefit from harmonizing overarching stewardship objectives and sharing information and data. Major discrepancies in stewardship objectives could otherwise create an unnecessary source/sink dynamic. Most neighbouring jurisdictions (Washington, Idaho, Montana, and Alberta) with grizzly bear populations benefit from the larger and more contiguous grizzly bear population in B.C. It is particularly important to maintain partnerships where grizzly bears are at extremely low densities and are at risk of local extirpation. Three bear populations in southeast B.C. connect to relatively small populations in Montana and Idaho. The North Cascades population is nearly extirpated in both B.C. and Washington and its recovery will require a collaborative approach from several governments.

British Columbia has been a member of the Interagency Grizzly Bear Committee (IGBC) with many US agencies for several decades. This US led group of high-level managers and biologists meet several times each year to ensure coordinated conservation actions across jurisdictional boundaries within the US but also along the B.C., Montana, Idaho, and Washington borders. In addition, B.C. biologists have worked closely with their US counterparts for over 40 years when grizzly bears were listed in the US under their Endangered Species Act in 1975.

The Border Grizzly Project from Montana began working with BC biologists on field projects in the Flathead Valley in 1978 and cooperation has been ongoing since then. B.C. biologists have also worked closely with US counterparts on both sides of the US border since 1998 in the Yaak and south Selkirk Mountains. In the south coastal mountains, B.C. biologists work with the B.C.-based Coast to Cascade Grizzly Bear Initiative and US-based Conservation Northwest on reducing human bear conflicts and grizzly bear recovery.

Grizzly bears regularly cross most of the B.C./Alberta border and cooperation between the two provinces varies. In no areas is this cooperation as formally established as it is with the US agencies because there is no IGBC equivalent, but cooperation exists at regional and provincial levels. Managers and researchers have, and continue to share information and data, and have even coordinated inventories on both sides of the B.C./Alberta border.

At a minimum, B.C. should continue to communicate with large carnivore biologists from neighbouring jurisdictions when considering policy changes or developing research programs on grizzly bears. Regionally, a yearly update from jurisdictions should be planned. For example, in the Peace Region, biologists try to have a yearly meeting with Alberta to discuss work that has been done and emerging priorities.

Alberta's work on bears in conflict that have been monitored post-translocation can be applied to B.C. population. Workers in southwest Alberta have implemented a very effective rancher-driven program improving the coexistence between ranchers and large carnivores. A similar program in B.C. could be beneficial. The data on translocated bears from B.C. has not yet been analyzed. As in B.C., Alberta's Government is currently interested in reducing human-bear conflicts by building on their [Bear Smart](#) program and more public education.

Yukon and NWT have lower densities of grizzly bears than B.C. but have similar stewardship issues. Gathering data to evaluate populations for sustainable harvest and to assess human impacts from increasing industrial development is a priority in both territories, which has resulted in a recent increase in research and inventory. The Yukon government has developed a [Conservation Plan for Grizzly Bears](#). The Yukon grizzly population is linked to the Skeena and Northern Rocky/Peace Regions and co-operative management could benefit conservation efforts. Cooperation between Alaska and B.C. on grizzly bear management issues has been minimal to date.

Due to the designation of the western population of grizzly bears in Canada (includes Nunavut, Northwest Territories, Yukon, Manitoba, Saskatchewan, Alberta, and British Columbia) as special concern under the *Species at Risk Act*, the federal government is required to develop a management plan for the broader western Canadian population. The province of B.C. and Environment and Climate Change Canada worked together, from 2020-2022, in engaging with First Nations throughout B.C. to gather feedback, indigenous perspectives, and knowledge to inform both the provincial framework and the federal plan. As of February, 2023, the federal plan is still in development, once finalized it will be available [here](#).

9.5 Population Inventory

An inventory is a survey designed to estimate population size or density (i.e. bears per 1000 km²) at a single point in time (i.e. one year). The most common management use for these data is to evaluate past or future mortality levels or recovery status. These surveys are typically done in a single season so one or two years of funding is all that is needed to obtain one estimate. However, evaluating population trends with these methods require multiple surveys spaced out by a number of years (see Trend Monitoring section below). Inventories are expensive because they require intensive sampling, usually several hundred thousand dollars. There have been over 30 grizzly bear inventories done in B.C. that have used similar hair sampling methods and DNA-based analysis to identify samples since 1996. Methods have evolved over time but have become quite standard given the level of repetition. A few earlier estimates of density are also available based on intensive live-trapping and radiotelemetry. Useful ancillary data on

population fragmentation and connectivity can also be obtained from these DNA-based surveys, both as a baseline and to assess the efficacy of management programs.

B.C. developed a model to estimate grizzly bear density in areas without field data based on a variety of habitat and human-use features and expert opinion (<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0082757>). Hence, extrapolated estimates of density are available for the entire province though these are best considered ballpark estimates. Inventories may be a priority in ecosystems where few if any previous inventories have been done and where local biologists or Indigenous Knowledge keepers have reason to believe the modeled estimates are incorrect. For example, few provincial inventories have been done of bear populations that eat salmon, making model-extrapolated estimates particularly uncertain for these regions. However, recent investments in inventory from central coast First Nations has produced population estimates that could be used to update and refine GBPU estimates. We also do not know how important salmon are to bears living in some transition areas like the Cranberry, and Babine units. Units with higher conservation risk and where bears eat salmon like Bulkley Lakes, François or Nulki could be priorities for inventory. Similarly, units with uncertain status like Blackwater-West Chilcotin, Nukli, or Moberly could be priorities for inventory. Lastly, measuring distribution and abundance in the extirpated zones could be priorities because bears are recolonizing these areas and data is needed to adjust unit boundaries or create new units. Previous to 2018, when grizzly bears were hunted, inventories were a priority because population estimates were needed to calculate sustainable harvests and hence quota and tag numbers. Now that there is no hunt, the need for inventory data has shifted towards other aspects of grizzly bear stewardship, such as recovery, measuring trends over time, and gaining a better understanding of grizzly bear distribution in the province.

More information on wildlife inventory in BC can be found in the “Towards a Big Game Inventory and Monitoring Strategy for BC⁸”.

It is recommended that inventory be prioritized based on the following criteria:

- The chance that the current estimate is inaccurate.
- The level of known and unknown human-caused mortality.
- How an improved estimate of abundance will improve grizzly bear conservation (e.g., is a population thought to possibly be ‘threatened’).
- Current threat level or conservation ranking of the unit, or emerging threats that may impact the conservation ranking (e.g., industrial development or salmon decline).
- Assessing the success of past recovery actions.
- Available funding and resources.

Inventory is expensive and though results in interesting data the data may not lead to any concrete conservation actions. The money spent on an inventory may have greater conservation outcomes if spent elsewhere.

⁸ www2.gov.bc.ca/assets/gov/sports-recreation-arts-and-culture/outdoor-recreation/fishing-and-hunting/hunting/towards_a_big_game_inventory_and_monitoring_strategy_for_bc.pdf

9.6 Trend Monitoring

A trend monitoring program is designed to measure population change through time and is most commonly used to detect a decline or recovery. Typically, there is considerable conservation concern for the target population. It takes at least three years of data to estimate trend and typically it will take >5 years to have any accuracy in the estimate. Monitoring trend is a long-term commitment. Previous inventory data in a target population can be used to build a monitoring program. It is usually better to begin a monitoring program with intensive sampling and then reduce the sampling level in future years to make the program more economical. Historic trends in abundance have been measured in one long-term research project in southeast B.C. and using the hunter harvest data. Both studies documented an increase in grizzly bear abundance during the 1980s to about the 2000s, when population growth leveled off and, in some places, declined. Historic changes in abundance on the coast are less certain because too few bears were hunted there to analyze growth, and there have been no long-term research projects on the coast of B.C. Future trends in grizzly bear abundance will need to be measured on the ground because hunter samples may not be available.

Population monitoring is on-going in the South Rockies, Flathead, Yahk, South Purcell, South Selkirk, Stein and South Chilcotin units. On the central coast, monitoring programs have been led by the Gitga'at, Heiltsuk, Kitasoo Xai'xais, Nuxalk and Wuikinuxv Nations. These programs began between 2006-2015 and have recently estimated grizzly bear density and diet via stable isotopes through non-invasive hair sampling. There is no long-term monitoring in the north of the province. Assuming the monitoring that is now going on will continue, the next locations that are good candidates for increased monitoring are places that have high non-hunting mortality (e.g., illegal kills, conflict kills, road or rail kills, etc.). The main two areas are the Bella-Coola to Hagensborg corridor and the Terrace-Kitimat area (see Figure 10 below but note the kill intensity is not adjusted for density, so these maps do not show the kill as a proportion of abundance). The Prince George-Pine Pass area also has high non-hunter kill levels and a low density of bears. Parts of the Rocky unit also have high non-hunter mortality. Possible priorities for increased monitoring are:

- Bella-Coola valley
- Kitimat-Terrace corridor
- Prince George area
- Moberly unit
- Rocky unit
- Nulki unit

Many new inventories are likely to be locally led and will be promoted based on local importance. The methods for monitoring grizzly bear populations have become quite standard and can be implemented with modest field effort, especially if field staff are going in the field for other reasons as well. The biggest technical challenges are study design considerations that must happen in the planning stage. Local Indigenous communities are often best situated to sample and monitor long term wildlife population trends in their territories. Locally delivered programs may be most efficient when delivered as partnerships with provincial wildlife staff and/or academics who have experience with study design and

may be able to provide field equipment, mapping or other support. Co-operative projects may also have a longer funding life because each partner may have access to different funding sources.

Importantly, Local Ecological Knowledge (LEK) from Indigenous and non-indigenous communities is a rich source of information on trends in grizzly bear abundance and distribution. A standardized and transparent approach for meaningfully incorporating LEK into our understanding of grizzly bear populations is exceptionally important and aligns with *UNDRIP* and the *Together for Wildlife Strategy*. This approach should be co-developed with interested First Nations.

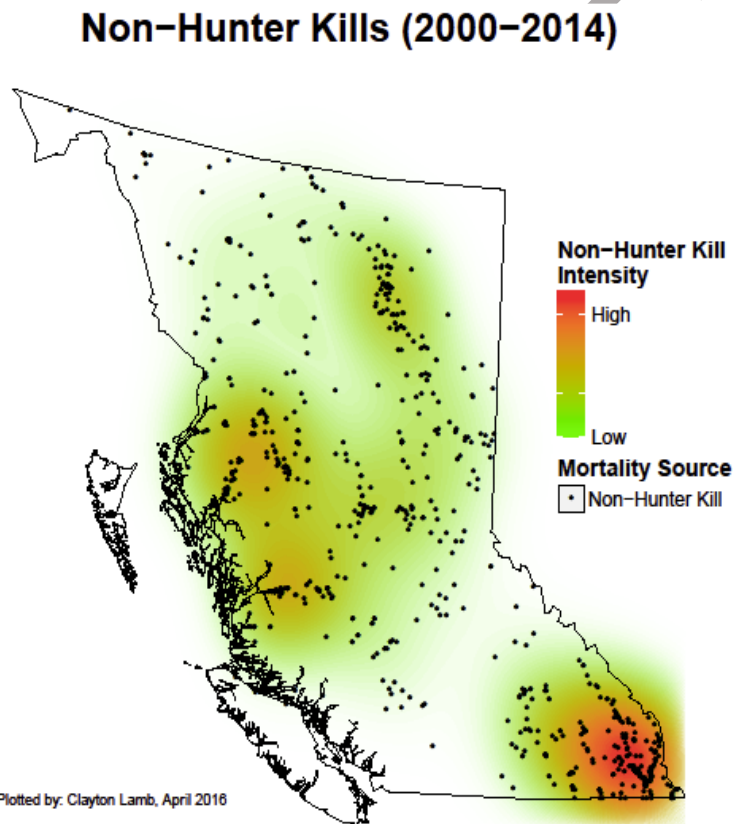


Figure 10. Recorded non-hunting mortalities of grizzly bears in B.C. during 2000-2014. Note that the conservation risk due to non-hunting mortality is related to the proportion of bears killed and the reporting rate which likely varies around the province.

It may be desirable to monitor bear populations in places with low human-caused mortality because there are other human impacts such as bear viewing that may impact population trend or habitat use. For example, the Kitasoo Xai'xais Nation on the central coast began intensively monitoring the potential impact of bear-viewing on the spatial and temporal patterns of grizzly bears in 2020 in response to dramatic increases in tourism pressure over the previous decade. Irrespective of human-caused mortality or other human impacts, a dramatic change in critical food resources, such as decline in salmon abundance, may also be an important impetus to monitor populations to assess current and projected conservation threat. In addition, it may be useful to monitor bears where there is very little human impact. Such a program would act as a reference area and may help us better understand reasons for

broad-scale population change. A planning process with First Nations and stakeholders could help select priorities areas for monitoring grizzly bears in B.C. Partnerships are increasingly important in any monitoring effort.

Monitoring results may be correlated with potential causal factors that were also monitored, but usually, reasons for changes in bear numbers will be unknown without additional research effort. If populations are in decline, and in particular if the population is small, then more intensive research may be needed.

9.7 Habitat Protection and Restoration

There are several hundred Wildlife Habitat Areas (WHAs) designated for grizzly bear under the *Forest and Range Practices Act and the Oil and Gas Activities Act* totaling almost 300,000 ha (To Be Confirmed). The effectiveness of these designations has not been comprehensively assessed. The Great Bear Rainforest Order also designates grizzly bear habitat as either Class 1 (100% habitat protection) or Class 2 (50% habitat protection), primarily to protect spring and summer forage values.

Additional habitat restoration and private land stewardship activities are underway and will further inform the effective conservation of grizzly bear habitat. For example, pilot projects using prescribed and cultural fire to encourage huckleberry regeneration and the targeted land acquisition of conservation lands have the potential to benefit grizzly bears, as well as numerous other wildlife species.

Parks and protected areas can be valuable tools for conservation of grizzly bears and their habitats. The Province has committed to protect 30% protection of B.C.'s land base by 2030. While the process for implementation is still being developed, they do represent potential significant benefits to grizzly bears.

Indigenous protected and conserved areas (IPCAs) are Indigenous-led land conservation initiatives. The concept and subsequent recommendations were introduced in a 2018 report *We Rise Together* by the Indigenous Circle of Experts (ICE). ICE was comprised of experts representing Indigenous, federal, provincial, and territorial governments who were directed to explore new approaches to protection and conservation of Canada's lands and waters. IPCAs are rooted in the exercise of constitutionally upheld Indigenous rights in accordance with Indigenous laws. In BC there are over 50 known existing or proposed Indigenous-led stewardship areas, varying in type, size, objective, and existing permitted land use activities. BC is committed to working with Indigenous communities to better understand their stewardship objectives and we are committed to working with First Nations on a co-managed approach to land and resource management that reflects their communities' vision. Engaging with Nations to understand and implement key objectives in IPCAs advances reconciliation by recognizing and upholding Indigenous rights (including treaty rights and the right to self-determination) and Indigenous peoples' self-described responsibilities to manage and steward their traditional territories.

9.8 Species and Population Stewardship

Access Management

Roads, and specifically high road densities, can have adverse effects on grizzly bears, and managing road access can be a valuable tool in grizzly bear stewardship. Approaches to manage access are varied, and can be done through Land Use Planning, regional wildlife advisory groups, or other local process.

Tools available to manage access include:

- The Motor Vehicle Prohibition Regulation of the *Wildlife Act*. More information available at <https://www2.gov.bc.ca/gov/content/sports-culture/recreation/motor-vehicle-prohibitions>.
- Forest and Range Practices Act,
- Road deactivation,
- Road deconstruction, and
- Gates or other physical barriers to road access.

Reduce human caused mortality related to accidents or conflict

Compulsory inspection for all grizzly bear mortalities enables tracking and analysis of mortality locations, mortality causes, sex, and age. Compulsory Inspection of human caused grizzly bear mortalities (i.e., conflict kills and accidents) was not ended when the licensed hunt was stopped.

Rehabilitation and re-wilding of orphaned grizzly bear cubs

British Columbia is the only jurisdiction in North America where orphaned grizzly cubs of the year have the opportunity to be rescued and returned to the wild to increase their chance of survival. Since 2007, the Province has permitted the rescue and rearing of orphaned grizzly bear cubs of the year for release back into the wild as yearlings. Orphaned grizzly cub rewilding provides a nonlethal alternative to lethal removal of cubs and could augment recovery initiatives in specific circumstances.

Collisions with Motor Vehicles and Trains

The quantity of direct mortality of grizzly bears due to collisions with vehicular and train traffic is unknown because many collisions go unreported, although reporting of a collision with wildlife is required under Section 75 of the *Wildlife Act*. Reported collisions/mortality from road and rail are through the provincial compulsory inspection database, linked through the [Grizzly Bear Conservation Ranking in B.C. website](#), however these data are likely only a small portion of the number of bears killed by road or rail. Kill location data can be used to determine where “hot spots” are and may assist in planning for mitigation activities.

There are currently connectivity mitigation and strike reduction projects in Rocky Mountain National Parks, strike reduction efforts with Canadian National Railway along the highway 16 corridor (this project is focused on moose), and there are Ministry of Transportation and Infrastructure (MOTI) led strike reduction efforts along Hwy 3 in the Rockies specifically designed with grizzly bear mortality in mind. There are [other wildlife crossing structures](#) in place designed for other wildlife species that could benefit

grizzly bears, and there may be options to modify existing structures (e.g. bridges and large culverts) to accommodate wildlife crossings. Crossing structures have been very effective at reducing highway mortality for wildlife where they have been tested, although research specifically on grizzly bears is rare.

MOTI efforts to reduce traffic collisions with wildlife may reduce ungulate and therefore highway attractants, but were not focused on grizzly bears (<https://www2.gov.bc.ca/gov/content/transportation/transportation-infrastructure/engineering-standards-guidelines/environmental-management/wildlife-management/wildlife-accident-reporting-system>). Carcasses of ungulates and other wildlife can be an attractant for grizzly bears, bringing them dangerously close to highways and rail lines. Near Elko, in the Kootenay region, a MOTI carcass pit in Elko was fenced to exclude bears and reduce roadkill attractants for bears along the Hwy 3 corridor. This greatly reduced the number of carcasses available to bears in the valley.

Specific conditions can be added to *Environmental Assessment Act* certificates to manage attractants and camps, reduce speeds on roads, and other sources of potential human caused mortality. Some developments even hire specialists to reduce wildlife conflicts in large camps or industrial developments.

Online resources available to inform the public on preventing or reducing road mortality of wildlife can be found at the [Wildlife Collision Prevention Program](#) and [DriveSmartBC](#).

Conflict

The province's [Bear Smart Community](#) program is a proactive conservation strategy that encourages communities, businesses, and individuals to reduce human-bear conflicts. It is based on a series of 6 criteria that communities must achieve to be designated as "Bear Smart". There are more than 20 communities in BC that are actively pursuing "Bear Smart status" and ten communities (Kamloops, Squamish, Lions Bay, Whistler, Port Alberni, Naramata, Coquitlam, New Denver, Castlegar and Port Hardy) that have successfully attained official "Bear Smart" status. Most of the human-bear conflicts in these communities are with black bears, but similar actions in these other communities where grizzly bear conflicts are more common will reduce conflicts with both species. Conflict-related bear mortalities over the long-term that occur in rural settlements between communities (towns) can effectively fragment, or even isolate a bear population. Therefore, conflict reduction should to be applied in these areas, especially if there are objectives to increase or maintain connectivity.

The BC Conservation Foundation hires, trains, and supervises more than 25 local WildSafeBC community coordinators who work seasonally to lead wildlife conflict reduction education at the community level in over 130 communities. The coordinators collaborate with the COS and work with local governments in adopting Bear Smart Community best practices. WildSafeBC delivers conflict reduction education through many activities such as: school programs, door-to-door outreach, community booths, education stickers on waste carts set out early, wildlife awareness and safety workshops, and more. WildSafeBC uses positive reinforcement messaging through their Business Pledge and Bare Campsite Program. In select communities, electric fencing education and cost-share support is also available. Provincially they use

tools such as social media, and eLearning courses, to reach a broader audience. There is currently a desire to:

- Provide a WildSafeBC program in all communities throughout the province that have requested one, including priority grizzly bear conflict management areas (e.g., Bella Coola, Terrace, Kitimat, Tumbler Ridge, Fernie, Sparwood, Elkford, Mackenzie).
- Increase support for rural communities through funding of a provincial electric fence program that provides technical support, training of local champions, and cost-share support.
- Increase staff retention and retain coordinators that are highly skilled and knowledgeable by offering more certainty in employment and offering more year-round opportunities.
- Increase engagement with First Nations (training, partnerships, funding) and the agricultural community (livestock/crop depredation) to reduce grizzly bear mortalities due to conflict.
- Incorporate, or make available, wildlife and respectful coexistence curriculum for schools throughout BC.
- Work with more Park Operators to support implementation of the Bare Campsite Program.
- Increased partnerships and consistent messaging across multiple agencies (e.g., WildSafeBC, COS, BC Parks, Ministry of Forests, Recreation Sites and Trails etc.)
- Proactively anticipate and prepare for more conflict in years of low or decreasing abundance of natural food availability.
- Evaluate the need for COS training and equipment to effectively conduct non-lethal response to grizzly bear conflict situations where appropriate.
- Support the Natural Resource Sector (i.e., EAO, EP) in their development of processes/standards through review of Industrial Camp Permits in occupied grizzly bear habitat.

Several projects have shown that there may be a need to go beyond education, into programs that provide expertise and other supports (e.g., cost-share electric fencing) to assist those living and working in grizzly bear habitats. Many First Nations, such as the Nuxalk and Kitasoo Xai'xais, have also created their own Wildlife Coexistence plans, trainings, and strategies.

The COS responses to human-bear conflicts are governed by the Prevention and Response to Conflict with Large Carnivores Procedure. This procedure was last updated in 2019. Amendments to the *Wildlife Act* in 2012 gave Conservation Officers the ability to issue tickets or appearance notices for a court appearance to address people who repeatedly and negligently fail to secure attractants for dangerous wildlife. These tools complement existing tools and are implemented by the COS to reduce the number of large predators, such as grizzly bears, that come into conflict with people. There is ongoing annual review and revision of policy, procedure, standards and training regarding responsible conflict reduction efforts and appropriate response from COS and other government agencies and partners.

Recommendations for improvements to these programs include:

- Support and enhance the WildSafeBC program through a multi-year agreement.

- More systematic recording of conflict data including details about: calls to the RAPP line, COS responses to calls, outcomes to responses, outcomes for people and bears, and economic costs for the various parts of the program.
- Increased and secure funding and training for First Nations Guardian/Coexistence programs, especially in remote communities where it is not feasible for the COS to address grizzly bear conflict issues. Changes to provincial policies to allow these programs access to training and subsequent authority and permissions that is granted to COS, so that they can respond to conflict with similar tools to conservation officers (e.g., immobilization and aversive conditioning training)
- Encouragement and guidance for municipalities to adopt bear conflict mitigation programs and practices.
- Improved clarity on how conflicts between grizzly bears and ranchers/farmers will be approached by government, i.e., funding for fences to protect crops from wildlife depredation.
- Increased education for hunters and recreational anglers on how to keep clean hunting and fishing camps including securing harvested game meat so grizzly bears cannot access the meat with a focus on improved hunter safety.
- Educate hunters and recreational anglers in basic bear behaviour and the use of bear spray to reduce the chance of human-bear conflicts.
- Educate other recreational land users such as hikers, campers, or ATV users in basic bear behaviour and best procedures for removing attractants from recreational use areas to reduce the chance of human-bear conflicts.
- Educate industrial land users in basic bear behaviour and best procedures for removing attractants from industrial or development sites to reduce the chance of human-bear conflicts.
- In areas prone to grizzly bears (or black bears) within town limits, replace all city/town landscaping to non-fruit bearing trees.
- Landscape level planning to encourage wildlife to move around towns, and not filter wildlife into towns.

Montana Fish Wildlife & Parks has been applying non-lethal conflict response actions on targeted conflict grizzly bears for over 3 decades. A pilot program imitating these methods with the B.C. COS was initiated with the assistance of an independent biologist in southeastern B.C where bears were radio collared to assess the efficacy of the program. Approximately 50% of candidate bears survived while monitored, breaking the cycle of conflicts at least in a portion of bears.

Population Recovery

- Recovery plans for Yahk, South Selkirks, Stein-Nahatlach, and North Cascades GBPU's
- have either been completed or are underway. These plans may include initiatives to
- translocate grizzly bears from healthy populations, restore and protect grizzly bear habitat, implement conflict reduction measures, and manage human activities.

Recovery actions are on-going in most threatened population units (see Table 3). Recovery actions should be directed by a local Recovery Plan or in the interim, a set of Recovery Objectives. These documents and

processes should be collaboratively developed by First Nations and Regional Wildlife and Habitat program staff, with input from stakeholders (potentially the Regional Wildlife Advisory Committees) and the public as appropriate. Implementation will also likely be collaborative, but government will need to participate when activities require permits or changes under the *Wildlife Act* such as translocation or access closures.

One example of grizzly bear population recovery within B.C. is the South Selkirk GBPU. In 2005 research was done to estimate the population size and evaluate threats to the population. Actions to mitigate threats to the population were applied over a 15-year period, including reducing human-bear conflict in both the front country and back country, increasing habitat connectivity, and access management. These programs and other activities resulted in a reduction in human-caused bear mortality, a substantial increase in population size, and a significant increase in inter-population connectivity. The South Selkirk GBPU is no longer an isolated population and has met recovery targets and is a demonstrated success story in efforts to recover grizzly bear populations.

Table 3. Threatened grizzly bear population units in BC with performance measures and provincial level priorities for action.

GBPU	Threat class	Actions toward recovery	Performance measures	Priority
Garibaldi-Pitt	M1	Baseline research completed but not analyzed	Analyze data collected	very high (3)
Stein-Nahatlach	M1	Habitat largely secured; Recovery working group in place	Initially transplant 2 females into unit: access restrictions in north of unit (Texas Creek)	very high (1)
North Cascades	M1	Recovery working group in place; Recovery plan revision underway. Work with USFWS	Revise recovery plan and consult on recovery	very high (2)
Granby-Kettle	M2	On-going access planning	Write recovery objectives	high (5)
Valhalla	M2	No specific work underway	Write recovery objectives	low
South Selkirks	M2	On-going attractant management and habitat connectivity creation; management plan written but not approved by government	Implement inventory to re-assess population status	moderate
Central Purcells	M2	On-going attractant management and habitat connectivity creation; management plan written but not approved by government	Endorse and implement Recovery plan	low
Yahk	M2	On-going attractant management and habitat connectivity creation; management plan written but not approved by government	Endorse and implement Recovery plan	moderate
South Rockies	M2	On-going monitoring and attractant management	Write recovery objectives	moderate
Moberly	M2	On-going inventory	Write recovery objectives	moderate
Flathead	M2.5	On-going monitoring and research	Write recovery objectives	low
Rocky Park Ranges	M2.5	Half is in National Park	Write recovery objectives	low

Squamish-Lillooet	M2.5	Baseline research completed but not analyzed	Analyze data collected	high (4)
Columbia-Shuswap	M2.5	Radiocollar of conflict bears	Write recovery objectives	low
Nulki	M2.5	Research on diet on-going	Write recovery objectives	moderate
Francois	M2.5	On-going inventory	Write recovery objectives	moderate

9.9 Hunting

In the winter of 2017, licensed grizzly bear hunting was closed in B.C. The broad closure was not specifically or directly in response to a conservation concern. Rather it was largely a reflection of many British Columbians' ethical or moral opposition towards grizzly bear hunting. Both the hunt, and the closure of the hunt, continue to generate strong reactions and emotions among the public in B.C. and beyond.

There is a deep spiritual connection between grizzly bears and many Indigenous Peoples. In many cases that connection includes a legal obligation to protect them, speak for them, and provide them with the same place on the landscape as a family member. Some of these Nations have a deep understanding that grizzly bears should not be hunted, and in some areas left respectfully alone to live without any sort of disturbance from humans.

By contrast, some First Nations have hunted grizzly bears since time immemorial and continue to do so. Hunting of grizzly bears for food, social, or ceremonial purposes by Indigenous Peoples within their territory is an aboriginal right. This right is recognized and respected by the Province of British Columbia, and in no way does this Grizzly Bear Stewardship Framework seek or presume to infringe, alter, or change the hunting rights of Indigenous peoples.

The Nisga'a Final Agreement includes allocation consideration for the purposes of licensed harvest of grizzly bear. There are also Indigenous communities that have an economic interest in guide outfitting, and grizzly bear hunting. For some of these communities, the closure of the grizzly bear hunt resulted in negative economic impacts, for others the closure of the hunt had positive economic impacts (e.g., coastal areas where bear viewing occurs). Some nations have expressed interest in reinstating a licensed hunt to provide a source of local income.

In March 2016, a team of independent scientists was contracted by the Fish and Wildlife Branch to conduct a scientific review of the Provincial Grizzly Bear Harvest Management Procedure. The review provided 50 recommendations for improvement for either the harvest management of grizzly bears, or overall grizzly bear management.

In 2017 the Auditor General of British Columbia published the "An Independent Audit of Grizzly Bear Management". Regarding grizzly bear hunting, the audit recommended that the Province 'revise its policy

and procedures to determine how uncertainty will be accounted for when determining grizzly bear hunt allocations and to be transparent about the process’.

Some First Nations choose to hunt grizzly bears as part of their traditional practices to pursue food, social and ceremonial harvest. Should licenced hunting be considered in future, it would require a more detailed and focused review of Indigenous and non-Indigenous perspectives, science, and policy (including population objectives, cumulative effects, and threat mitigation) than is contemplated in this document.

9.10 Viewing

British Columbia is a highly sought after destination for bear viewing. Consequently, bear viewing has increased in popularity in recent years, and it has proven to be an important tourism activity in BC. Some bear viewing operations have expanded two and threefold over the past several years and many First Nations are now operating successful bear viewing and ecotourism businesses. While benefits are being realized, the potential impacts to bears are increasingly a concern. The scientific literature combined with experience from practitioners describes the potential spatial, temporal, and behavioral impacts of viewers on bears and provides recommendations to help reduce and minimize impacts on bears, though many gaps remain in our knowledge.

The Commercial Bear Viewing Association of BC developed bear viewing best management practices (BMPs), aimed at minimizing impacts of viewers on bears. Most recently updated in 2018, these BMPs were reviewed by the government for alignment with the current state of knowledge around minimizing viewer impacts on bears. These BMPs are actively used by many commercial viewing companies. Some First Nations have also developed management provisions and guidelines for bear viewing activity in their territories.

Government of B.C.’s legislative framework for authorizing commercial bear viewing activities comes primarily from the *Park Act* and *Land Act*. No authorization is currently required for the public to view bears recreationally (i.e., when they are not using services of a commercial operator), apart from abiding by any land use designation that restricts public access such as closures under the *Wildlife Act*.

Under the *Land Act*, a non-exclusive License of Occupation is required for commercial bear viewing unless the activity is classified as incidental use. Starting in 2006, all *Land Act* tenure holders carrying out wildlife viewing activities were required to abide by the desired behaviors in the provincial “Tourism Wildlife Guidelines for Backcountry Tourism and Recreation”; this included best practices for bear viewing.

Through the *Park Act*, BC Parks authorizes bear viewing activities through Park Use Permits. These permits allow the government to evaluate proposed activities and develop and enforce necessary permit conditions for viewing activities that require these permits. Operators typically submit Management Plans for their bear viewing activity for review with park use permit applications. Permit conditions vary and are aimed at minimizing the impact of viewers on bears, and can include restrictions on areas open for

viewing, access considerations, viewer numbers or viewing days, and viewing times. Permit conditions and management approaches are often developed collaboratively by First nations and BC Parks.

Recommendation #5 from the 2017 independent audit of Grizzly Bear Management in B.C. was that “the Ministry of Forests, Lands and Natural resources and the ministry of Environment develop clear policies and procedures for bear viewing”. In response to this audit and recognizing the increasing interest in bear viewing opportunities and potential impacts of viewing on bears, an independent British Columbia Commercial Bear Viewing Strategy is being (“has been” when the documents are finalized) developed that proposes a comprehensive path forward for commercial bear viewing in B.C.

In 2019, the B.C. government began collaboratively developing policies and procedures for bear viewing with First Nations, industry, and stakeholders which will inform the Commercial Bear Viewing Strategy. These policies and procedures will minimize impacts to bears and maximize viewer safety while maintaining viable bear viewing operations by considering the spatial, temporal, and behavioral aspects of commercial viewing.

The government of B.C. has also supported research and monitoring efforts to better understand impacts of viewers on bears. See the draft provincial ‘Commercial Bear Viewing Strategy’ for more detail on this topic.

10 MEASURING PROGRESS

Performance indicators provide a way to define and measure progress toward achieving the stewardship goals. The measures below are high level measures that index progress at the provincial scale. Specific measures will also be considered as part of the action planning to implement this framework.

1. Establish government to government relationships with First Nations to collaborate on the stewardship of grizzly bears in B.C.
2. Enhance and fund further connections between grizzly bear stewardship initiatives and First Nations guardian programs.
3. Identify and map areas where grizzly bear recovery is desirable and not desirable, including areas of connectivity between populations, through engagement with local Indigenous communities.
4. Review cumulative effects and threat rankings and update with Local Ecological Knowledge as required.
5. Recover all grizzly bear populations, where it is socially desirable, such that each population is self-sustaining.
6. Write stewardship objectives, or a more detailed document, for all Grizzly Bear Population Units in B.C. (or other areas, as appropriate), including currently unoccupied areas, and share with the public.
7. Ensure habitat objectives for grizzly bears are considered at all scales of industrial development. This includes the planning for habitat supply and security for bears in timber supply reviews and considering berry abundance post logging in collaboration with First Nations in B.C., create a legal and

regulatory framework for commercial bear viewing that promotes the bear viewing industry but also protects bears from human disturbance and maximizes public safety.

8. Track human-grizzly bear conflict annually and make these data publicly available.
9. Secure long-term funding for WildSafeBC and First Nations led wildlife coexistence programs. Create and analyze performance indicators for this program.
10. Consider long-term funding for coexistence programs that connects experts with landowners to manage their attractants.
11. Analyze the B.C. data on grizzly bear conflict and mitigation to suggest best practices and streamline cost-benefit.
12. Monitor population trends, and the sustainability of human-caused mortality rates in all high or extreme conservation ranked grizzly bear populations.
13. Assess the level of fragmentation and connectivity for populations suspected to be at risk of fragmentation or isolation.
14. Monitor the annual and spatial abundance of important grizzly bears foods and share this data with the public. Use this information to inform conservation and monitoring programs.
15. Support research to explore knowledge gaps in grizzly bear conservation and grizzly bear well being.

11 CONCLUSION AND NEXT STEPS

This framework points to the need to evaluate and implement grizzly bear conservation and stewardship measures locally or regionally. There are currently no vehicles for doing this, so the first step is to create or identify local working groups (for example Regional Wildlife Advisory Committees) to begin the conservation planning process. Once a group has been established or identified, there are several similar logical tasks that are required for each area:

1. Assess whether the [mapping of the distribution of the population](#) is accurate or should the population boundaries be amended?
2. Discuss whether the 2019 Threat analysis is accurate. Examine the accuracy of the data that went into the evaluation of each threat for GBPU's of greatest conservation concern. Were local measures considered appropriately? For example, were access closures considered in the road metrics? Were current on the ground measures such as habitat protection orders, population monitoring, or conflict reduction efforts considered in the review? Finally, revise the threat level based on the local evaluation of threats if needed.
3. Consider whether grizzly bear recovery is acceptable throughout the unit and if it is not how would stewardship actions differ in the areas where recovery is not acceptable?
4. Create a series of stewardship objectives for the population and rank these objectives for action.
5. Consider updates to the *Wildlife Act* that will support grizzly bear stewardship.

12 SUGGESTED READING

- Mark A. Haroldson, Melanie Clapham, Cecily C. Costello, Kerry A. Gunther, Katherine C. Kendall, Sterling D. Miller, Karine E. Pigeon, Michael F. Proctor, Karyn D. Rode, Christopher Servheen, Gordon B. Stenhouse, Frank T. van Manen (2020) Part II - Species Account, *Brown Bear (Ursus arctos; North America)*. Chapter 13. *Bears of the World, Ecology, Conservation and Management*, edited by Vincenzo Penteriani and Mario Melletti. Cambridge University Press, pp.162
- Proctor, M. F., B. N. McLellan, G. B. Stenhouse, G. Mowat, C. T. Lamb, and M. Boyce. 2019. The effects of roads and motorized human access on grizzly bear populations in British Columbia and Alberta, Canada. *Ursus* 30e2:6-19. <http://www.transbordergrizzlybearproject.ca/research/publications.html>
- Schwartz, C. C., S. D. Miller, and M. A. Haroldson. 2003. Grizzly Bears (*Ursus arctos*). Pages 556–586 in G. A. Feldhamer, B. C. Thompson, and J. A. Chapman, editors. *Wild Mammals of North America*. Second Edition. The Johns Hopkins University Press, Baltimore, USA.

13 REFERENCES

- Adams, M., Service, C., Bateman, A., Bourbonnais, M., Artelle, K., Nelson, T., Paquet, P., Levi, T., and Darimont, C. 2017. Intrapopulation diversity in isotopic niche over landscapes: Spatial patterns inform conservation of bear-salmon systems. *Ecosphere* 8(6):e01843. 10.1002/ecs2.1843
- Adams, M., Connors, B., Levi, T., Shaw, D., Walkus, J., Rogers, S., Darimont, C. 2021. Local values and data empower culturally-guided ecosystem-based fisheries management of the Wuikinuxv bear-salmon-human system. *Marine and Coastal Fisheries* 13(4): 362-378.
- Apps, C., B. McLellan, and C. Servheen. 2013. Multi-scale population and behavioural responses by grizzly bears to habitat and human influence across the southern Canadian Rocky Mountains. Version 2.0. Aspen Wildlife Research in collaboration with Ministry of Forests, Lands and Natural Resource Operations, and the US Fish and Wildlife Service.
- Artelle, K.A., S.C. Anderson, A.B. Cooper, P.C. Paquet, J.D. Reynolds, C.T. Darimont. 2013. Confronting uncertainty in wildlife management: performance of grizzly bear management in British Columbia, Canada. *PLOS ONE* 8(11): e78041.
- Artelle, K.A., Anderson, S.C., Reynolds, J.D., Cooper, A.B., Paquet, P.C., and Darimont, C.T. 2016. Ecology of conflict: marine food supply affects human-wildlife interactions on land. *Scientific Reports* 6: 25936.
- Artelle, K.A., Adams, M.A., Bryan, H.M., Darimont, C.T., Housty, W., Moody, J., Neasloss, D., Service, C., and Walkus, J. 2021. Decolonial Model of Environmental Management and Conservation: Insights from Indigenous-led grizzly bear conservation in the Great Bear Rainforest. *Ethics, Policy, & Environment* 24(3): 283-323.
- Artelle, K.A., Sun, C., Bourbonnais, M.L., Reynolds, and Darimont, C.T. *In revision*. Combining Spatial Capture Recapture (SCR) and network analyses to inform land-use planning: Insights from grizzly bears in the Great Bear Rainforest.
- British Columbia Conservation Data Centre. BC Species and Ecosystems Explorer for grizzly bear. B.C. Min. Environ., Victoria, BC. <<http://a100.gov.bc.ca/pub/eswp/>>

- British Columbia Ministry of Environment and Climate Change Strategy. 2009. Conservation framework— Conservation priorities for species and ecosystems: primer. Ecosystems Br., Environ. Stewardship Div., Victoria, BC. <http://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/species-ecosystems-at-risk/species-at-risk-documents/cf_primer.pdf>
- British Columbia “Together for Wildlife Strategy” <https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/together-for-wildlife/together-for-wildlife-strategy.pdf>
- Bryan, H.M., C.T. Darimont, P.C. Paquet, K.E. Wynne-Edwards and J.E. Smits. 2013. Stress and reproductive hormones in grizzly bears reflect nutritional benefits and social consequences of a salmon niche. PLOS ONE 8(11): e80537. [Open Access](#).
- Bryan, H.M., C.T. Darimont, P.C. Paquet, K.E. Wynne-Edwards and J.E. Smits. 2014. Stress and reproductive hormones reflect inter-specific social and nutritional conditions mediated by resource availability in a bear-salmon system. Conservation Physiology 2 (1). [Open Access](#).
- Davis, E.L., C.C. Mustaphi, and M.F.J. Pisaric. 2018. Forests, fire histories, and futures of Columbian and Rocky Mountain forests, western Canada. Western Geography 23:3-11
- Declaration on the Rights of Indigenous Peoples Act*, SBC 2019, c 44, articles 5, 16, 24, 26, 27, 29, 31, 32 [DRIPA].
- Ermine, Willie. 2007. “The Ethical Space of Engagement.” Indigenous Law Journal 6(1): 193-203.
- Government of Canada. 2002. Species at Risk Act [S.C. 2002] c. 29. Justice Laws website <<http://laws-lois.justice.gc.ca/eng/acts/S-15.3/page-1.html>>
- Henson, L.H., Balkenhol, N., Gustas, R., Adams, M., Walkus, J., Housty, W., Stronen, A.V., Moody, J., Service, C., Reece, D., VonHoldt, B., McKechnie, I., Koop, B.F., Darimont, C.T. 2021. Convergent geographic patterns between grizzly bear population genetic structure and Indigenous language groups in coastal British Columbia, Canada. Ecology & Society 26(3): 7.
- Housty, W.G., A. Noson, G.W. Scoville, J. Boulanger, C.T. Darimont, and C.E. Filardi. 2014. Grizzly bear monitoring by the Heiltsuk people as a scientific crucible for First Nations conservation practice. Ecology and Society 19 (2): 70. [Open Access](#).
- Kitchener, A.C. 2010. Taxonomic issues in bears: impacts on conservation in zoos and the wild, and gaps in current knowledge. International Zoo Yearbook. 44: 33–46
- Loring, S. and A. Spiess. 2007. Further Documentation Supporting the Former Existence of Grizzly Bears (*Ursus arctos*) in Northern Quebec-Labrador. Arctic 60:7-16
- Master, L.L., D. Faber-Langendoen, R. Bittman, G.A. Hammerson, B. Heidel, L. Ramsay, K. Snow, A. Teucher, and A. Tomaino. 2012. NatureServe conservation status assessments: factors for evaluating species and ecosystems at risk. NatureServe, Arlington, VA. <http://www.natureserve.org/sites/default/files/publications/files/natureserveconservationstatusfactors_apr12_1.pdf>
- McLellan, C.R. 2018. Food availability and grizzly bear (*Ursus arctos*) selection of post-fire and thinned forests in the mountain national parks of Canada. M.Sc. Thesis. University of Alberta.

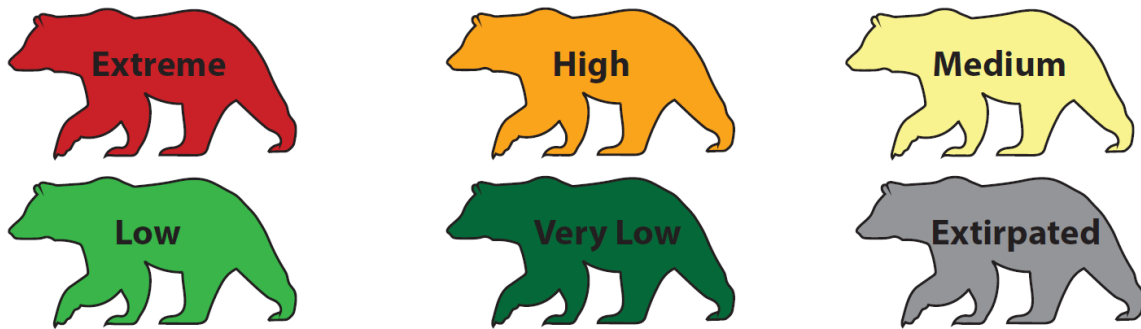
- NatureServe. 2002. Element occurrence data standard 2002. Available at http://downloads.natureserve.org/conservation_tools/element_occurrence_data_standard.pdf
- NatureServe. NatureServe explorer: an online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, VA. <http://www.natureserve.org/explorer>
- Open Standards. 2014. Threats taxonomy. < <http://cmp-openstandards.org/using-os/tools/threats-taxonomy/>>
- Paetkau, D., Shields, G. F. & Strobeck, C. (1998): Gene flow between insular, coastal and interior populations of brown bears in Alaska. *Molecular Ecology* 7: 1283–1292.
- Proctor, M.F., D. Paetkau, B.N. McLellan, G.B. Stenhouse, K.C. Kendall, R.D. Mace, W.F. Kasworm, C. Servheen, C.L. Lausen, M.L. Gibeau, W.L. Wakkinen, M.A. Haroldson, G. Mowat, C.D. Apps, L.M. Ciarniello, R.M.R. Barclay, M.S. Boyce, C.C. Schwartz, and C. Strobeck. 2012. Population Fragmentation and Inter-Ecosystem Movements of Grizzly Bears in Western Canada and the Northern United States. *Wildlife Monographs* 180:1-46. <http://www.transbordergrizzlybearproject.ca/research/publications.html>
- Proctor, M.F., S.E. Nielsen, W.F. Kasworm, C. Servheen, T.G. Radandt, A.G. MacHutchon, and M.S. Boyce. 2015. Grizzly bear connectivity mapping in the Canada-US trans-border region. *Journal of Wildlife Management* 79:544-555. <http://www.transbordergrizzlybearproject.ca/research/publications.html>
- Proctor, M. F., W. F. Kasworm, K. M. Annis, A. G. MacHutchon, J. E. Teisberg, T. G. Radandt, C. Servheen. 2018. Conservation of threatened Canada-USA trans-border grizzly bears linked to comprehensive conflict reduction. *Human Wildlife Interactions* 12:248-272. <http://www.transbordergrizzlybearproject.ca/research/publications.html>
- Proctor, M. F., C. T. Lamb, J. Boulanger, A. G. MacHutchon, W. F. Kasworm, D. Paetkau, M. S. Boyce, and C. Servheen. (Revision in review). The dance of berries and bullets: the influence of food resources and mortality risk on grizzly bear populations in southeastern British Columbia. Trans-border Grizzly Bear Project, Kaslo, BC. <http://www.transbordergrizzlybearproject.ca/research/publications.html>
- Proctor, M.F., A. G., MacHutchon, J. Boulanger, and D. Paetkau. 2023. Evaluating grizzly bear conservation management: quantifying recovery in the Canadian South Selkirk population unit in southeast British Columbia. Trans-border Grizzly Bear Project, Kaslo, BC. <http://www.transbordergrizzlybearproject.ca/research/publications.html> Proctor, M. F., B. N. McLellan,
- Province of British Columbia. 1982. Wildlife Act [RSBC 1996] c. 488. Queen's Printer, Victoria, BC. http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96488_01
- Province of British Columbia. 2002. Forest and Range Practices Act [RSBC 2002] c. 69. Queen's Printer, Victoria, BC. http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_02069_01
- Province of British Columbia. 2004. Identified wildlife management strategy. B.C. Min. Environ., Victoria, BC. <http://www.env.gov.bc.ca/wld/frpa/iwms/index.html>
- Province of British Columbia. 2008. Oil and Gas Activities Act [SBC 2008] c. 36. Queen's Printer, Victoria, BC. http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_08036_01

- Salafsky, N., D. Salzer, A.J. Stattersfield, C. Hilton-Taylor, R. Neugarten, S.H.M. Butchart, B. Collen, N. Cox, L.L. Master, S. O'Connor, and D. Wilkie. 2008. A standard lexicon for biodiversity conservation: unified classifications of threats and actions. *Conserv. Biol.* 22:897–911.
- Service, C.N., M.S. Adams, K.A. Artelle, P.C. Paquet, L.V. Grant and C.T. Darimont. 2014. Indigenous knowledge and science unite to reveal spatial and temporal dimensions of distributional shift in wildlife of conservation concern. *PLOS ONE* 9(7): e101595
- Stenhouse, G. Mowat, C. T. Lamb, and M. Boyce. 2018. Resource Roads and Grizzly Bears in British Columbia, and Alberta. Canadian Grizzly Bear Management Series, Resource Road Management. Trans-border Grizzly Bear Project. Kaslo, BC. Canada
<http://transbordergrizzlybearproject.ca/research/publications.html>.
- Other common references used:
- B.C. Ministry of Water, Land and Air Protection. 2004. Procedures for managing identified wildlife. Version 2004. B.C. Min. Water, Land and Air Protection, Victoria, BC.
<<http://www.env.gov.bc.ca/wld/frpa/iwms/procedures.html>>
- B.C. Ministry of Environment. 2010. British Columbia guide to recovery planning for species and ecosystems. B.C. Min. Environ., Victoria, BC. 32 pp.
<<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>>
- B.C. Ministry of Environment and Climate Change Strategy. Approved wildlife habitat areas. B.C. Min. Environ., Victoria, BC. <<http://www.env.gov.bc.ca/wld/frpa/iwms/wha.html>>
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Ottawa, ON.
- NatureServe. 2004. Animal element occurrence (EO) specifications. *In* Biotics5 Online Help. NatureServe, Arlington, VA.
<<http://help.natureserve.org/biotics/#Methodology/AnimalEOSpecs.htm%3FTocPath%3DMethodology%2520%2526%25C2%25A0Guidelines%7CEO%25C2%25A0Specifications%7C1>>
- NatureServe. 2004. Habitat-based plant element occurrence delimitation guidance. *In* Biotics5 Online Help. NatureServe, Arlington, VA.
<<http://help.natureserve.org/biotics/#Methodology/PlantEOSpecs.htm%3FTocPath%3DMethodology%2520%2526%25C2%25A0Guidelines%7CEO%25C2%25A0Specifications%7CHabitat-based%2520Plant%2520Element%2520Occurrence%2520Delimitation%2520Guidance%7C0>>
- Province of British Columbia. 1996a. Land Act [RSBC 1996] c. 245. Queen's Printer, Victoria, BC.
<http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96245_01>
- Province of British Columbia. 1996b. Mines Act [RSBC 1996] c. 293. Queen's Printer, Victoria, BC.
<http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96293_01>
- Spieß, A., and Cox, S. 1976. Discovery of the skull of a grizzly bear in Labrador. *Arctic* 29: 194-200.

Appendix A: Approaches to meet Grizzly Bear Stewardship Objectives.

Step 1: Gather information on the grizzly bear population in question.

1-1: Refer to the Grizzly Bear Conservation Ranking in B.C. website for ranking, population estimates, threats, and historic mortality:
<https://www.env.gov.bc.ca/soe/indicators/plants-and-animals/grizzly-bears.html>



1-2: Identify the threats facing the population.
Note, threats considered negligible province-wide in the stewardship framework are not included below.

Residential/ Commercial Development	Energy Production and Mining	Major Road and Rail Corridors	Resource Use Including Forestry
Agriculture	Human Intrusion and Disturbance	Backcountry Roads	Climate Change/ Extreme Weather

1-3: Identify the effect(s) the threat(s) are having on the population.

Population Fragmentation or Isolation	Displacement of bears from preferred habitat	Reduction in Habitat Quantity/Quality	Food Limitation
Reduced Fecundity (reproduction)	Direct Adult Mortality	Cub Mortality	

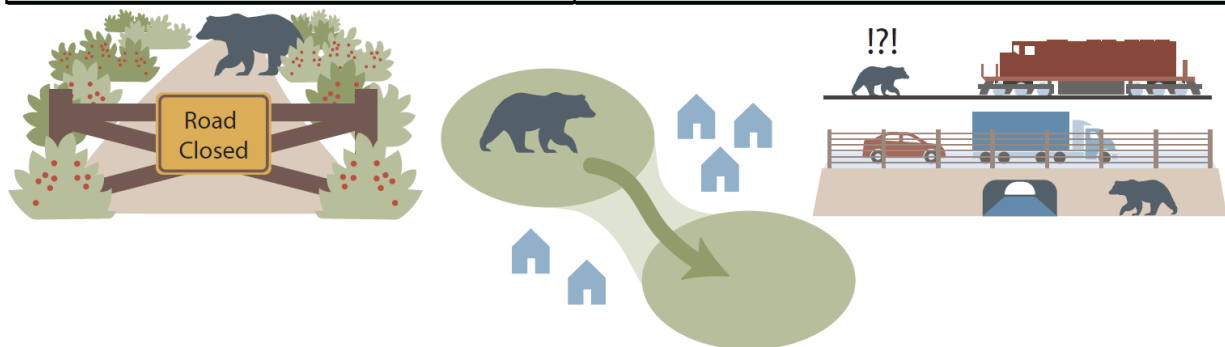
Step 2: Identify Stewardship Objectives for the grizzly bear population. Examples of potential objectives are provided below. Actions, resources and tools for each are provided on the following pages

Improve co-existence, minimize conflict, exclude bears, or reduce human risk	Increase/Recover Population	Re-establish Connectivity
---	--------------------------------	------------------------------

Objective: Improve co-existence, minimize conflict, or reduce human risk	
Action	Resources and tools
Bear Hazard Assessment	Wildsafe BC Bear Smart website IUCN BSG HBCET Approaches to human-bear conflict (hyperlink will be added when available)
Attractant Management	Identify attractant sources (e.g., roadkill disposal sites, landfills) Electric Fencing Bear resistant garbage cans Livestock feed containment Livestock protection (e.g., calving pens, livestock dogs) Livestock carcass disposal (e.g., fenced, buried, or composted) Agrizultural crop protection (e.g. orchards, corn fields) Acoustic deterrants
Community Education	Foster public stewardship Workshops and presentations Professional guidance
Conflict Response	BC Conservation Officer Service Responding to conflict with large carnivores procedure Non-lethal management Lethal management
Re-establish connectivity	Refer to Resources and Tools to meet "Re-establish Connectivity" objective



Objective: Re-establish Connectivity	
Action	Resources and tools
Improve co-existence, minimize conflict, or reduce human risk	Refer to Resources and Tools to meet "Improve Co-existence, Minimize Conflict, or Reduce Human Risk" objective
Reduce backcountry mortality and habitat displacement	Identify best grizzly bear habitats for access management Seasonal or year-round road closures: <i>Wildlife Act</i> <i>Forest and Range Practices Act</i> <i>Park Act</i> (if within a B.C. Park) Road deactivation Hunter education on species identification Attractant management for outdoor recreationalists Public education on non-lethal defence (i.e. bear spray)
Connectivity Management	Identify and protect corridors Critical foods/habitat management and protection Land purchases, easements, and trades Legal road closures Voluntary road closures Land Use Planning Road deactivation Crossing and fencing structures on highways



Objective: Increase or recover populations.	
Action	Resources and tools
Develop and implement a Recovery Plan	Consult with professional biologists that specialize in grizzly bear conservation. Recovery plans for some GBPU's are being developed and can be used as examples. When available they will be posted online.
Improve co-existence, minimize conflict, or reduce human risk	Refer to Resources and Tools to meet "Improve Co-existence, Minimize Conflict, or Reduce Human Risk" objective
Translocations and augmentation	Refer to the Translocation Policy and Procedure
Re-establish Connectivity	Refer to Resources and Tools to meet "Re-establish Connectivity" objective

Appendix B: Grizzly Bear Management in the Great Bear Rainforest

In the early 2000s, the Central Coast and North Coast land use planning processes were the first such processes to be conducted in the context of government to government (G2G) agreements. The *General Protocol on Land Use Planning* between the Coastal First Nations and the BC government provided that the planning tables would be co-managed and in the case of the NCLRMP co-chaired, and that recommendations from the multi-stakeholder planning tables would inform later G2G discussions between the B.C. government and the First Nations.⁹

Following submission of the Central Coast and North Coast Land and Resource Management Plans recommendation reports in 2004, after several months of G2G discussions, agreement on a land use decision for the GBR was reached between First Nations and the B.C. government in early 2006. This agreement was incorporated into Strategic Land Use Planning Agreements (SLUPAs); bilateral agreements between individual First Nations and the B.C. government.¹⁰ Broader agreements were also entered into by the B.C. government and First Nation coalitions including the Coastal First Nations (CFN)¹¹ and Nanwakolas Council.¹²

The SLUPAs and related collective agreements established a comprehensive G2G commitment for collaborative implementation of GBR land use decisions. Amendments to the *Park Act* and a new Order in Council under the *Environment and Land Use Act* were developed to enable legal designation of more than 100 new protected areas, many of which encompassed critical and important Grizzly bear habitat. A G2G technical team comprised of senior First Nation and B.C. government representatives was established to develop recommendations on a new land use regulation. The first GBR Land Use Order, enacted in 2007, added further protections for Grizzly bears in the form of legal requirement to, on the remaining land base, protect 100% of Class 1 and 50% of Class 2 bear spring and summer forage habitat.

Over the past 15 years the CFN Nations and the BC government have continued to work on a collaborative G2G basis to advance the protection and stewardship of Grizzly bears and their habitats.

⁹ See <https://www.for.gov.bc.ca/tasb/slrp/citbc/finalprotocol.pdf>

¹⁰ See for example the Gitga'at SLUPA: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/westcoast-region/great-bear-rainforest/great-bear-rainforest-first-nations-agreements/gitgaat_fn_signed_slupa.pdf

¹¹ See https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/westcoast-region/great-bear-rainforest/great-bear-rainforest-first-nations-agreements/turning_point_protocol_agreement_signed_optimized.pdf

¹² See <https://nanwakolas.com/wp-content/uploads/2020/08/AIP-FInal-Signed-Version-compressed.pdf>

Critical habitat inventories have been improved. Field research by First Nations revealed that Grizzly bears now occupy outer coast islands and population unit maps and habitat protection measures have been expanded accordingly. Recent amendments to the GBR Land Use Order now provide enhanced protection for Grizzly bear dens and other critical habitat, and for the riparian forests next to fish-bearing streams that bears rely on. A forthcoming amendment to the GBR Land Use Orders proposes to establish a requirement to create landscape level reserve plans that will enhance protection of bear travel corridors and other landscape features.

In 2006 the CFN Nations and BC Parks entered into collaborative management agreements. The Nations have worked closely with BC Parks to develop new approaches for managing bear viewing and other activities that impact Grizzly bears. For example, Kitsoo Xai'xais Nation, with support from BC Parks, began intensively monitoring the potential impact of bear-viewing on Grizzly bears in response to dramatic increases in tourism pressure over the previous decade. Operational bear viewing management plans are being established in many protected areas in the GBR, and in areas where bear viewing has become popular. Some of these plans are also identifying equitable access to viewing opportunities for Nations.

In 2009 the Coastal First Nations and the BC government entered into a Reconciliation Protocol. The protocol created a new framework for shared land and resource decision making, including decisions that may impact Grizzly bears. Implementation of this framework has led to creation of new collaborative approaches for granting and managing tenures for commercial bear viewing under the Park Act and the Land Act. And protocols between First Nations and commercial operators are creating working relationships and a more stable and effective arrangement for shared management of Grizzly bear and other wildlife viewing operations. Many CFN Nations, such as the Nuxalk and Kitsoo Xai'xais, have also created their own wildlife coexistence plans for their communities, with associated training and management strategies.