



SPECIES STATUS REPORT

Grizzly Bear

(Ursus arctos)

Aklaq, Aklak, Aklat, Akhaq, Aghat, Akłak (Inuvialuktun)

Shih, Sheh, Atsanh (Gwich'in)

Sah dek'oo, Sahcho, Sahtso (Tłı̄chǫ)

Sahcho (South Slavey)

Dléze, Sas (Chipewyan)

Sahcho, Sahsho, Gokw'ı̄ sahcho káyeł/káłe, Gokw'ı̄ sahcho

káreł/káłe, Gow'ı̄ sahsho káyeł/káłe (Sahtú)

Ours grizzli (French)

in the Northwest Territories

Status of Grizzly Bear in the NWT

Species at Risk Committee status reports are working documents used in assigning the status of species suspected of being at risk in the Northwest Territories (NWT).

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ABOUT THE SPECIES AT RISK COMMITTEE

The Species at Risk Committee was established under the *Species at Risk (NWT) Act*. It is an independent committee of experts responsible for assessing the biological status of species at risk in the NWT. The Committee uses the assessments to make recommendations on the listing of species at risk. The Committee uses objective biological criteria in its assessments and does not consider socio-economic factors. Assessments are based on species status reports that include the best available Aboriginal traditional knowledge, community knowledge and scientific knowledge of the species. The status report is approved by the Committee before a species is assessed.

ABOUT THIS REPORT

This species status report is a comprehensive report that compiles and analyzes the best available information on the biological status of grizzly bears in the NWT, as well as existing and potential threats and positive influences. Full guidelines for the preparation of species status reports, including a description of the review process, may be found at www.nwt-species-at-risk.ca.



Environment and Natural Resources, Government of the Northwest Territories, provides full administrative and financial support to the Species at Risk Committee.

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Assessment of Grizzly Bear

The Northwest Territories Species at Risk Committee met in Yellowknife, Northwest Territories on November 15, 2016 and assessed the biological status of grizzly bears in the Northwest Territories. The assessment results were not released until April 2017 to facilitate the bundling of assessment results with two other species. The assessment was based on this approved status report. The assessment process and objective biological criteria used by the Species at Risk Committee are available at: www.nwt-species-at-risk.ca.

Assessment: Special concern in the Northwest Territories

Special concern – May become threatened or endangered in the Northwest Territories because of a combination of biological characteristics and identified threats.

Reasons for the assessment: Grizzly bear fit criterion (b) for special concern.

(b) – The species may become threatened if negative factors are neither reversed nor managed effectively.

Main Factors:

- This means that grizzly bears could become threatened or endangered because of a combination of biological characteristics and identified threats.
- Of the overall population estimate of 4,000-5,000 grizzly bears in the Northwest Territories, only an estimated 2,000-3,000 are mature individuals. This is considered to be a small population.
- There is evidence that in some areas (Gwich'in Settlement Area, Mackenzie Delta, Mackenzie Mountains) the number of grizzly bears is stable or increasing. However, density throughout the Northwest Territories is naturally low and outside the Richardson and southern Mackenzie mountains is very low.
- Although grizzly bears are long-lived, their reproductive output is very low, making them less resilient to disturbance and other factors affecting their population. A female grizzly bear becomes sexually mature at 4-5 years, but most reproduce later (e.g., 8 years). Litters of 1-3 cubs are produced approximately every four years.
- Limiting biological characteristics like small population, delayed age at maturity, and low reproduction rate make grizzly bears more vulnerable to the effects of threats.
- Because the land in much of the Northwest Territories has low productivity, home ranges of grizzly bears include the largest ranges reported for the species. This suggests that grizzly bears in the Northwest Territories require a great deal of habitat to obtain the resources they need. Future reduction in habitat is therefore of concern.

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- Hibernation is one of the most notable aspects of grizzly bear life history. This is a key time for grizzly bears during which they are more vulnerable to disturbances and habitat changes (e.g., climate change altering timing of seasons). All grizzly bears in the Northwest Territories are expected to den for several months, unlike bears in southern North America.
- Although their range is apparently expanding (e.g., Arctic Archipelago), the reasons behind this expansion are not well understood.
- The main threats are:
 - Recent behavioural changes in grizzly bears (e.g., attraction to hunting activities) have been noted in the Mackenzie Mountains and there are already indications of increasing instances of human-grizzly bear interactions.
 - Although the current level of human-caused mortality is estimated at less than one percent of the total estimated population, even a small increase in human-caused mortality can negatively impact the population. Current and future increases in human-grizzly interactions, leading to human-caused mortality, may become a threat, causing population decline.
 - Permanent removal of suitable habitat by human activity within grizzly bear range remains relatively small in terms of the species' overall range in the Northwest Territories. However, because individual grizzly bears need large home ranges, avoidance of industrial projects, increased future resource development, and establishment of transportation corridors could potentially pose a significant threat by the removal of a larger portion of effective habitat.

Additional Factors:

- Reduced availability of barren-ground caribou as a prey resource could become a limiting factor for grizzly bears on the barrens.
- Random natural events and changes to habitat due to climate change appear to be less significant threats; however, these impacts are not fully understood. In general, the impact of climate change on grizzly bears in the Northwest Territories is speculative.

Positive influences to grizzly bears and their habitat:

- Implementation of co-management plans in the Inuvialuit Settlement Region and Gwich'in Settlement Area represents a positive influence on the species.
- More than 12% of the range of the species is covered by protected areas. This level of formal protection of grizzly bear habitat ranks among the highest afforded the species in North America.

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- The Government of the Northwest Territories' *Big Game Hunting Regulations* prohibit hunters from hunting grizzly bears in dens or any grizzly bear accompanied by a cub. The new *Wildlife Act* prohibits breaking into, damaging, or destroying dens.

Recommendations:

- Comprehensive and coordinated traditional knowledge research should be conducted on grizzly bears within much of their range.
- Re-assess the status of grizzly bears as significant new information is made available.
- Create a comprehensive system to track human-caused mortality of grizzly bears throughout their range in the Northwest Territories.
- Promote measures to prevent human-grizzly bear conflicts.
- Conduct population studies of grizzly bears, particularly in the Mackenzie Mountains.
- When looking at the feasibility of options for predator management for caribou, take into account the results of this assessment.

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Executive Summary

Traditional and Community Knowledge	Scientific Knowledge
Description	
<p>Grizzly bears are a large bear with a thick, brown, glossy coat. They have a prominent ‘hump’ on their shoulders and a distinct ‘grizzled’ appearance that comes as a result of coat hairs having lighter hair tips. Grizzly bears are feared and respected from a cultural standpoint and carry a great deal of spiritual significance for several Aboriginal groups in the Northwest Territories (NWT). While they were once traditionally harvested for their meat when more desirable species were not available, they are now mainly hunted for their hides. Grizzly bears are also hunted during the course of big game hunts in the Inuvialuit Settlement Region (ISR) and Gwich’in Settlement Area (GSA).</p>	<p>The grizzly (or brown) bear of the NWT is a large bear with adaptations for omnivory (eating both plants and animals). Distinguishing features of grizzly bears, compared to other bears, include adaptations for digging (very long claws and large shoulder muscles that give the species its characteristic ‘hump’) and a concave facial profile (curving inward). Colouration ranges from shades of light brown or cream to dark brown, often with guard hairs on the shoulders and back tipped with a lighter shade to give the fur a ‘grizzled’ appearance (and the species its namesake).</p>
Traditional and Community Knowledge	Scientific Knowledge
Distribution	
<p>In the NWT, grizzly bears are found in the Mackenzie Mountains, the Mackenzie Delta, along the northern coastline of the territory, and on the barrenlands up to and including the treeline. They can travel over long distances and move constantly in search of food resources. Population groupings (i.e., Delta grizzly bears, mountain grizzly bears [Mackenzie Mountains and Richardson Mountains], and barren-land grizzly bears) are</p>	<p>Grizzly bears in North America are only found in a few small and isolated subpopulations in the lower 48 states, and a large population that is continuously distributed from western Alberta to coastal British Columbia and north to include almost all of Alaska and the Yukon, and east to include much of the NWT and mainland Nunavut. Grizzly bear range in the NWT includes the entire mainland except the Taiga Plains south of Great Bear Lake and east</p>

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<p>not considered distinct, although they may be discussed separately because of geography (i.e., mountain ranges) or habitat preference.</p> <p>It has been observed that the distribution of grizzly bears has expanded further north, as well as further south, meaning that grizzly bears appear to be expanding their range on both fronts in the NWT.</p>	<p>of the Mackenzie Mountains, and excluding the Taiga Shield to the southeast of Great Slave Lake. Recent observations suggest the species is expanding its distribution north to include Victoria Island, Banks Island, and Melville Island.</p>
<p>Traditional and Community Knowledge</p>	<p>Scientific Knowledge</p>
<p>Biology and Behaviour</p>	
<p>Females enter their dens pregnant and give birth in the den during the winter. They emerge in the spring with one, two, or three cubs. Cubs stay with their mother for two or three years, during which time they are taught to hunt and gather food so that they may eventually live on their own. Grizzly bears may live for a long time in the wild, with bears in the GSA known to live up to 30-35 years.</p> <p>Knowledge holders use coat and body condition to tell whether or not a bear is healthy. A shiny fat bear is considered to be a healthy animal. In general, knowledge holders consider grizzly bears to be a healthy animal, although they are susceptible to internal parasites and may get injured in fights with other bears. ‘Old age’ is considered to be the most important health issue faced by grizzly bears, resulting in poor/missing teeth, which hampers the ability of grizzly bears to obtain food.</p> <p>Grizzly bears den during the winter. They</p>	<p>Grizzly bears in the NWT occur across a range of habitats, from low elevation barrens along the coast of the Arctic Ocean and northeast of the treeline to the Nunavut border, to islands of the Canadian Arctic Archipelago, to subarctic taiga and high elevation alpine habitat as found in the Mackenzie Mountains. The wide distributional range of the species reflects their generalist approach to habitat selection and omnivorous diet. Prior to denning in autumn, carbohydrate-rich berry crops are typically consumed in large quantities.</p> <p>Grizzly bears undergo dormancy (denning or hibernation) in winter, entering a den that is usually excavated on a slope with a southern aspect in late October and occupying it for as long as seven months (timing varies by sex and age). Cubs are born in dens in litters of usually between 1-3 offspring. Females and males will reach physiological maturity at approximately five years of age, but age at first reproduction can be delayed, especially in areas of poor</p>

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spend the summer and autumn consuming food and also preparing their dens for the winter. Grizzly bears emerge from their dens in the spring when the weather warms up, as early as March and as late as the beginning of June.

productivity (e.g., on the barrens) where females may not produce a litter until eight years of age. Generation length (average age of parents of newborns) is between 10-15 years, and longevity between 20-30 years in the wild. The sex and age structure of grizzly bear populations are strongly influenced by reproductive rates and by the management regime to which a population is subjected. In the NWT, approximately half the population can be expected to be of breeding age.

In general, movements (home ranges, directions, movement rates) are tied to age and sex, and habitat or feeding requirements; the latter may include seasonal migrations in elevation (as described for the Mackenzie Mountains) or movements related to the composition of habitat in the home range and seasonally available food sources including major prey species like caribou. Home ranges of grizzly bears in the NWT include the largest ranges reported for the species, particularly for bears inhabiting the central barrens of mainland NWT. Home ranges of males in the NWT average approximately 1,150-7,250 km² and females 250-2,100 km².

Interspecific interactions are largely characterized by the niche filled by the grizzly bear as an omnivore and predator. Disease and parasitism has not been noted as an important limiting factor for any grizzly bear population.

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Traditional and Community Knowledge	Scientific Knowledge
Population	
<p>Knowledge holders note that trying to compare grizzly bear populations between different time periods is difficult because observations are affected by how and when people access the land. In the past, people travelled over long distances very slowly, and moved around seasonally in order to access resources. Today people can travel very quickly, and may not be on the land as frequently or use it in the same way.</p> <p>The Gwich'in of the NWT suggest that there have been three population decreases in the past, and a more recent period of population stability and increase. These population decreases (1940s-1960s, 1970s-1980s, and 1980s-1990s) were thought to have taken place because of scarcity of food resources compounded by increasing access to the land (i.e., skidoos became common) and overhunting. The more recent period of population stability has been attributed to a decrease in hunting pressure coinciding with the implementation of a grizzly bear management plan in the GSA that includes quotas on harvesting.</p> <p>Knowledge holders in the GSA and Mackenzie Mountains think that if current conditions continue, the grizzly bear population will remain stable and potentially increase.</p>	<p>Densities of grizzly bears are highest in the Richardson Mountains and Mackenzie Mountains. Density declines as the population ranges into the low Arctic tundra, with the lowest densities occurring north of the treeline along the Mackenzie River delta, in the central barrens of the NWT/West Kitikmeot, and in the Arctic Archipelago.</p> <p>Using study-specific density estimates and assigning them more broadly at the ecoregion level provides an estimated population of between 4,000-5,000 grizzly bears in the NWT. This comprises about eight percent (%) of the estimated North American population of grizzly bears and approximately 16% of the Canadian population of grizzly bears.</p> <p>The best available information suggests that there is no evidence of decline and the population is at the very least stable, with local population increases likely occurring in the Mackenzie Mountains, parts of the mainland ISR, and most certainly in the Arctic Archipelago (although here densities remain very low).</p>

Status of Grizzly Bear in the NWT

Traditional and Community Knowledge	Scientific Knowledge
Habitat	
<p>Grizzly bears have two primary habitat requirements: adequate food sources and suitable denning sites. Suitable denning sites are found on well-drained slopes, with the slope usually south facing. Grizzly bears also prefer habitats characterized by relatively open areas that are not too warm during the summer months. The exception to this is female bears, who may intentionally choose less desirable habitat in order to avoid males and keep their cubs safe. The outskirts of eskers on the barrenlands have been identified as a particularly desirable habitat type for grizzly bears. Important food sources include barren-ground caribou, fish, and berries.</p> <p>There are no specific areas favoured by bears within their range as they constantly move about looking for food sources. Protection zones that are created for grizzly bears should be large and cover areas that hold an abundance of food resources.</p>	<p>Habitat use in the NWT is not expected to differ substantially from historic times; i.e., there does not appear to be substantial areas of suitable habitat that are not occupied by the species. Habitat fragmentation as a barrier to dispersal is expected to be very low for the NWT. Trends in habitat availability are not expected to be pronounced; recent trends would suggest an increase in availability of habitat associated with new sightings of grizzly bears in the Arctic Archipelago.</p>
Traditional and Community Knowledge	Scientific Knowledge
Threats and limiting factors	
<p>The most significant factors limiting the grizzly bear population are development and human-grizzly bear interactions. When encounters between humans and bears occur, it</p>	<p>The main threat affecting grizzly bear distribution and abundance in the NWT (and all of North America) is human-caused mortality. In the NWT, main sources of</p>

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is most often the bear that suffers loss of life. Knowledge holders have observed that bears are becoming bolder, but also that people are less aware of how to interact with bears. Development can result in a loss of denning habitat and potential food resources, creation of potential barriers that may cause fragmentation, noise, traffic, harassment, increased access, and an increase in potential food resources (i.e., dumps), which may lead to an increase in human-grizzly bear interactions.

Stochastic natural events and changes to habitat due to climate change are less significant threats. The least significant threat is hunting pressure, which has decreased since the 1990s.

human-caused mortality include licensed hunting, Aboriginal subsistence harvesting, and kills in defense of life and property. A small number of bears may be killed by accident (e.g., from collisions), or during the course of research, and unreported mortality, including illegal kills, may also exist (although these numbers are expected to be very low for the NWT). The current level of estimated human-caused mortality, at or near 1.0% or less, is likely sustainable and not a current threat to causing NWT-wide population decline.

Threats to grizzly bears from habitat disturbance have been primarily studied in the context of mining and exploration in the central barrens near Lac de Gras and surrounding sites, and areas of oil and gas exploration in the Mackenzie River delta, mining potential in the Mackenzie Mountains, and the creation of future transportation corridors. Avoidance of industrial projects, increased future resource development and the establishment of transportation corridors could potentially pose a significant threat to grizzly bears. However, permanent removal of suitable habitat by human activity within grizzly bear range remains relatively small in terms of the species' overall range in the NWT.

The impact of climate change on grizzly bears in the NWT is, for the most part, speculative, and identifying the influence of climate change on projected grizzly bear numbers (or prey and habitat) is not possible at this time. Potential risks due to disease, contaminants, and other factors are minor for grizzly bears in the NWT.

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Traditional and Community Knowledge	Scientific Knowledge
Positive Influences	
<p>Until the implementation of co-management plans in the GSA and ISR, the grizzly bear population was considered to be in decline. These plans have been identified by knowledge holders as a positive influence with a large degree of impact. Climate change may have a positive or neutral influence (e.g., creation of habitat, extension of mating season) but the impacts on grizzly bears are not well understood.</p>	<p>Thus far it would appear that levels of human-caused mortality are sustainable (at or less than 1.0% of the total NWT population), and several management and land claim agreements that take into account the sustainable harvest of grizzly bears are in place. Protected areas with very strong provisions offered to grizzly bears (e.g., habitat protection measures, regulation of development, special consideration of the impacts of creating road access, etc.) comprise more than 12% of the range of the species in the NWT (greater if excluding areas of water and sea ice). This level of formal protection of grizzly bear habitat ranks among the strongest afforded the species in North America.</p>

Technical Summary

Question TK/CK; <i>Science</i>	Traditional & Community Knowledge	Scientific Knowledge
Population trends		
Generation time (<i>average age of parents in the population</i>) (indicate years, months, days, etc.).	Information not available in the sources.	10-15 years.
Number of mature individuals in the NWT (or give a range of estimates).	Estimates of the number of mature individuals are not available in the sources.	Estimated between 2,000 – 3,000.
Amount of change in numbers in the recent past; <i>Percent change in total number of mature individuals over the last 10 years or 3 generations, whichever is longer.</i>	Gwich'in knowledge holders have observed periods of decline in the grizzly bear population in the past (1940s-1960s, 1970s-1980s, and 1980s-1990s) and that the grizzly bear population in the Gwich'in Settlement Area (GSA) and surrounding regions is now stable and potentially increasing. In the Mackenzie Mountains, mainland Inuvialuit Settlement Region (ISR), and Banks and Victoria islands, increasing numbers have been observed. Trend information for other areas in the NWT is not available.	The best available information suggests that there is no evidence of decline and the population is at the very least stable, with local population increases likely occurring in the Mackenzie Mountains, parts of the mainland ISR, and most certainly in the Arctic Archipelago (although here densities remain very low).
Amount of change in numbers	It is predicted that the grizzly	Information not available.

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Question TK/CK; <i>Science</i>	Traditional & Community Knowledge	Scientific Knowledge
predicted in the near future; <i>Percent change in total number of mature individuals over the next 10 years or 3 generations, whichever is longer.</i>	bear population in the GSA and Mackenzie Mountains may continue to increase over the next decade if hunting pressure continues to remain low. Information for other areas of the NWT is not available.	
Amount of change happening now; <i>Percent change in total number of mature individuals over any 10 year or 3 generation period which includes both the past and the future.</i>	Gwich'in knowledge holders have observed that the grizzly bear population in the GSA and surrounding regions is now stable and potentially increasing. Likewise, numbers in the Mackenzie Mountains, mainland ISR, and Banks and Victoria islands, have been increasing. Information for other areas in the NWT is not available.	Overall stability considering ten years on either side of present day.
If there is a decline (<i>in the number of mature individuals</i>), is the decline likely to continue if nothing is done?	No definitive recent decline has been noted, although some knowledge holders in the ISR have expressed concern for grizzly bears being 'in danger'.	No decline.
If there is a decline, are the causes of the decline reversible?	Many of the potential threats to the grizzly bear population are man-made (i.e., human-grizzly bear interactions, development) and thus can be reversed.	No decline.

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Question TK/CK; <i>Science</i>	Traditional & Community Knowledge	Scientific Knowledge
If there is a decline, are the causes of the decline clearly understood?	Threats are identified and understood. The cumulative impacts of multiple threats are not known.	No decline.
If there is a decline, have the causes of the decline been removed?	No. Hunting pressure has been reduced but other threats remain: human-grizzly bear interactions, development, natural events, and climate change.	No decline.
If there are fluctuations or declines, are they within, or outside of, natural cycles?	This is not known from the sources examined.	Within natural cycles of density dependence.
Are there extreme changes in the number of mature individuals?	There is no evidence for extreme fluctuations although both population increases (population stable or increasing) and declines (to the point of 'rarity') have been observed within the GSA.	No.
Distribution Trends		
Where is the species found in the NWT? <i>Estimated extent of occurrence in the NWT (in km²).</i>	Grizzly bears in the NWT are found in mountainous terrain (i.e., the Mackenzie Mountain range, the Richardson Mountains), in the Mackenzie Delta, along the northern coast, and on the barrenlands up to and including the treeline.	About 1,953,000 km ² .

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Question TK/CK; <i>Science</i>	Traditional & Community Knowledge	Scientific Knowledge
How much of its range is suitable habitat? <i>Index of area of occupancy (IAO) in the NWT (in km²; based on 2 × 2 grid).</i>	Grizzly bears are adept at moving to more suitable habitat when their current habitat becomes unfavourable (i.e., food sources are inadequate, suitable denning sites are not available). They are equally adept at moving back into their former habitat when conditions change. Their entire range thus serves as an ever-changing mosaic of suitable and unsuitable habitat.	About 879,000 km ² .
How many populations are there? To what degree would the different populations be likely to be impacted by a single threat? <i>Number of extant locations in the NWT.</i>	Information not available in sources.	Since harvest management may differ throughout the NWT, the number of extant locations that are possible exceeds the threshold of 10.
Is the distribution, habitat or habitat quality showing a decline that is likely to continue if nothing is done? <i>Is there a continuing decline in area, extent and/or quality of habitat?</i>	The distribution of grizzly bears in the NWT is thought to be expanding, with knowledge holders in the ISR observing grizzly bears in more northerly locations than expected, and Métis knowledge holders noting range expansion into the North Slave region. There was no specific reference to habitat or habitat quality trends in the sources examined.	No.

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Is the number of populations or amount of occupied area showing a decline that is likely to continue if nothing is done? <i>Is there a continuing decline in number of locations, number of populations, extent of occupancy and/or IAO?</i>	No.	No.
Are there extreme fluctuations in the range or the number of populations? <i>Are there extreme fluctuations (>1 order of magnitude) in number of locations, extent of occupancy and/or IAO?</i>	Available information did not make note of extreme fluctuations in either range or number of populations.	No.
Are most individuals found within small and isolated populations? <i>Is the total population severely fragmented (most individuals found within small and isolated populations)?</i>	No.	No.
Immigration from populations elsewhere		
Does the species exist elsewhere?	Yes.	Yes. Grizzly bears have a large range and are found in Asia, Europe, and North America. In Canada, they are found in other jurisdictions including Yukon, Nunavut, British Columbia,

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Question TK/CK; <i>Science</i>	Traditional & Community Knowledge	Scientific Knowledge
		Alberta, and Manitoba.
Status of the outside population(s)?	Information not available in sources.	Special Concern (Western population, Canada [COSEWIC 2012 status update]); est. 6,000-7,000 bears in the Yukon; est. 1,500 bears in Nunavut; est. 16,000 bears in British Columbia; est. 30,000 bears in Alaska.
Is immigration known or possible?	Yes, grizzly bears are known to travel long distances, and thus immigration is possible.	Yes.
Would immigrants be adapted to survive and reproduce in the NWT?	Information not available in sources.	Yes. If immigration occurred, likely source populations would be from the Yukon, Nunavut, British Columbia, and Alaska.
Is there enough good habitat for immigrants in the NWT?	Information not available in sources.	Yes.
Is the NWT population self-sustaining or does it depend on immigration for long-term survival?	The NWT population is thought to be stable to increasing, indicating that it is likely self-sustaining.	Yes, self-sustaining.
Threats and limiting factors		
Briefly summarize negative influences and indicate the magnitude and imminence for each.	The most significant factors are development and human-grizzly bear interactions. Stochastic natural events and changes to habitat due to climate change	Human-caused mortality at a rate of approximately 1.0% of the total NWT population per year (likely sustainable and not a current threat to causing

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Question TK/CK; <i>Science</i>	Traditional & Community Knowledge	Scientific Knowledge
	are less significant threats. The least significant threat is hunting pressure, which has decreased since the 1990s.	NWT-wide population decline). Local avoidance of industrial projects, increased future resource development, and the establishment of transportation corridors could potentially pose a significant threat to grizzly bears. However, permanent removal of suitable habitat by human activity within grizzly bear range remains relatively small in terms of the species' overall range in the NWT.
Positive influences		
Briefly summarize positive influences and indicate the magnitude and imminence for each.	The sources examined identified existing co-management plans as a positive influence with a large degree of impact. Climate change may have a positive or neutral influence but the impacts on grizzly bears are not well understood.	Management tools including grizzly bear co-management plans/agreements in the ISR and GSA, legislation, hunting regulations and bylaws, and the Sahtú Land Use Plan variably provide for the establishment of harvest quotas and set out protections for dens, grizzly bears in dens, and grizzly bears accompanied by cubs. Protected areas with very strong provisions offered to grizzly bears (e.g., habitat protection measures, regulation of development, and special

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Question TK/CK; <i>Science</i>	Traditional & Community Knowledge	Scientific Knowledge
		consideration to the impacts of creating road access) comprise more than 12% of the area of occupancy for the species (greater if excluding areas of water and sea ice).

Traditional and Community Knowledge component

PREAMBLE

Traditional knowledge within the Northwest Territories (NWT) has been passed on from generation to generation over centuries and through a variety of means (i.e., legends, songs, dances, experience) (Inuvik Community Corporation [ICC] *et al.* 2006). As the traditions of the Aboriginal peoples of the NWT remain in practice, with many people still choosing to spend time on the land, this knowledge remains relevant and in circulation (ICC *et al.* 2006). Organizations within the NWT such as the Gwich'in Social and Cultural Institute, Inuvialuit Cultural Resource Centre, and the Tłı̨chǫ Culture and Lands Protection Department play a key role in gathering, recording, and publicly documenting traditional knowledge for future generations. Community knowledge does not imply only the knowledge of traditional communities in the NWT, but also the knowledge of members of the public, including outfitters, resident hunters and naturalists.

Source summary and gaps/omissions

In the Inuvik region, the Inuvialuit have some publicly available resources that document grizzly bear traditional knowledge, although not a focused publication dedicated to this purpose. The *Inuvialuit Settlement Region Traditional Knowledge Report* (ICC *et al.* 2006) proved useful for the purposes of this report. Additional information was supplied through the publication *Inuvialuit and Nanuq: A Polar Bear Traditional Knowledge Study* (Joint Secretariat 2015) and *Grizzly and Black Bear Local Knowledge Summary Report: All Communities* (Resources, Wildlife and Economic Development [RWED] 2003), which also contain traditional knowledge on grizzly bears.

The Gwich'in have actively invested in documenting and publishing their traditional knowledge. For example, the Gwich'in Traditional Knowledge Project has undertaken the goal of recording and mapping Gwich'in Elders' knowledge, including traditional ecological knowledge (Gwich'in Renewable Resources Board [GRRB] 2015). In 2014, the Gwich'in Social and Cultural Institute (GSCI) and the GRRB released the publication *Gwich'in Knowledge of Grizzly Bears*, formally documenting current and historical traditional knowledge on grizzly bears in this region.

Although a great deal of traditional knowledge exists about grizzly bears in the other regions, neither the Sahtú (Benson pers. comm. 2014; Simmons pers. comm. 2014), nor the Dehcho have focused or formalized traditional knowledge studies on grizzly bears, thus both of these administrative regions present a significant knowledge gap within this report. Information from

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the Yukon that could have been used to supplement Sahtú and Dehcho grizzly bear knowledge is largely unavailable at this time (Mulders pers. comm. 2016). There is similarly a lack of available documented traditional knowledge for grizzly bears in the Mackenzie Mountains. However, for the Mackenzie Mountains, a substantial amount of community knowledge was drawn from Larter and Allaire's (2015) *Mackenzie Mountain Non-resident and Non-resident Alien Hunter Harvest Summary 2014* report. This report included wildlife observations and harvesting information from non-resident and non-resident alien harvesters in the Mackenzie Mountains during the 2014 hunting season. It builds upon similar survey work that has taken place since 1995, in cooperation with the eight licensed outfitters that operate in the Mackenzie Mountains.

For the Tłı̨chǫ communities of the North Slave region, grizzly bears are encountered while on the barrenlands, and thus traditional knowledge does exist. It is, unfortunately though, not well documented or readily available to researchers (Jacobsen pers. comm. 2014; Pellissey pers. comm. 2014). Barren-ground caribou outfitters may also hold important grizzly bear community knowledge, but it is unfortunately largely unavailable at this time. The Denesuline of the North Slave region are currently participating in a research project with the University of Calgary in order to formally gather and document grizzly bear traditional knowledge (Tollis pers. comm. 2014). This project is in the information gathering stage (Tollis pers. comm. 2014; Unger pers. comm. 2014). Some grizzly bear traditional knowledge for the Slave Geological Province has been gathered under the auspices of the West Kitikmeot Slave Study, and is reflected in this report. During the course of the environmental assessment process for various resource extraction projects, the North Slave Métis Alliance (NSMA) has consolidated some of its traditional knowledge, along with more recent observations including knowledge related to grizzly bears. This information is reflected within this report.

The Dene (De Beers Canada Inc. 2010) and Métis of the South Slave region encounter grizzly bears when on the land (NSMA 2012a; NSMA 2012b; NSMA 2001), although they may not be commonly encountered within the region itself (with the exception of the eastern portion of the South Slave region, which falls within grizzly bear range). Members of the Deninu Kue First Nation from Fort Resolution, for example, had traditional practices related to hunting grizzly bears (see *Regional/cultural background*, p.141 for more detail), and some of this is documented. This information is reflected within this report.

Some researchers have pointed out that the particular type of respect afforded to grizzly bears (see *Spiritual and cultural importance*, p. 25 for more details) can mean that knowledge holders that are being interviewed will not talk directly about grizzly bears, or will limit what they say so as to avoid 'talking smart' or disrespectfully (Clark 1996; Clark and Slocombe 2009). This may also limit transmission of available traditional knowledge (Clark 1996).

Most information obtained over the course of research for this report would be considered current. There are some references to older practices and ways of life, but the majority of traditional and community knowledge in this report was obtained within the last three decades

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(1990s-2010s).

Some Nunavut resources from the West Kitikmeot/Slave Geological Province were excluded because they are outside of the NWT or could not be obtained. Similarly, information in some resources from the Yukon (in particular resources from the North Slope) were excluded. It is acknowledged that these groups may have hunted within the NWT and that their particular terminology, as well as legends and traditional and community knowledge, may thus be applicable to grizzly bears in the NWT.

Spiritual/cultural importance

Respect¹ for grizzly bears appears to be a pervasive theme in the NWT, with grizzly bears inspiring fear and representing danger. As such, there are rituals and rites surrounding grizzly bears, but also special ways of discussing them and showing respect. What follows is a discussion of the spiritual/cultural significance of grizzly bears, as well as their use by humans across the NWT, for those groups where information is available.

The Inuvialuit

Within the ISR, the grizzly bear is feared and respected. It has specific spiritual attributes and was hunted for subsistence in the past. A traditional Inuvialuit belief is that “grizzlies are smart, they can hear you talking about them” (Inuvik verification sessions, May 2006 *in ICC et al.* 2006: 11-37). Some Inuvialuit may practice post-mortem rituals on dead bears, indicating a particular level of respect. For example, some Inuvialuit remove the hyoid bone from the throat of a grizzly bear that has been killed, a practice that is meant to “ensure that the bear’s spirit will not remain angry with the hunter” (Clark and Slocombe 2009: 8).² Clark (1996) noted that there were cases in the ISR of problem bear carcasses being burned after the bears were shot, potentially representing a post-mortem ritual of respect.

It is believed that grizzly bears and wolverines are ‘spiritual counterparts’ (ICC *et al.* 2006), for example sharing a similar gait and ‘look’ when running:

¹ Clark (1996) argues that Aboriginal peoples’ concept of ‘respect’ for grizzly bears fundamentally differs from that of western views of ‘respect’. As an example, Clark (1996) groups Aboriginal practices of respect into different categories that encompass ‘living culture’ (i.e., terminology, stories, reciprocity, and ritual), which is epitomized by living mutually or co-existing, rather than attempting to manage or control grizzly bears for their (and our) own benefit. From this perspective, grizzly bears are not thought of at the level of population unit, but considered as individual animals, or more specifically, ‘non-human persons’.

² Clark (1996) draws a tie between the Inuvialuit practice of removing the hyoid bone and the legend referred to by the Gwich’in in which a human woman married a bear. Through the course of the Gwich’in legend, the human woman turns into a bear and is shot by her human brothers with arrows (McClellan 1970). The hyoid bone may represent a symbolic removal of an ‘arrowhead’, thus appeasing the spirit of the bear (McClellan 1970; Clark 1996; Clark and Slocombe 2009).

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“...I don’t know how to say in a spiritual way...the wolverine and the grizzly bear they look...like brother, you see a wolverine running, it’s just like watching a grizzly bear running, if you see a grizzly bear running from miles away it’s like seeing a wolverine running, they both run the same...” (AK237³ in ICC *et al.* 2006: 11-37).

Grizzly bears were traditionally harvested for their meat⁴ when more desirable species were unavailable (i.e., moose, caribou) (INU132, AK239 in ICC *et al.* 2006). Lard was made out of the fat (AK206 in ICC *et al.* 2006) and the fat rendered from the female breast was “reputed to be good for people with allergies” (Inuvik verification sessions, May 2006 in ICC *et al.* 2006: 11- 43). The skins were taken and used to make particularly warm mattresses (Inuvik verification sessions, May 2006 in ICC *et al.* 2006).

The Gwich’in

The Gwich’in consider the grizzly bear to be spiritually powerful (Gwich’in Elders 1997). Some people will say that they “sleep to shih (grizzly bear)”, meaning that the grizzly bear is their spirit-protector (Gwich’in Elders 1997: 68). It is believed that when they sleep to it, the grizzly bear will tell them about the future (Gwich’in Elders 1997). Grizzly bears are spoken about as though they are equivalent to human beings. There are explanations for this, including a legend that at one time a bear had been married to a human woman (refer to *Footnote 2*, p. 25 for more information on this legend) (McClellan 1970; Clark and Slocombe 2009; GSCI and GRRB 2014). Some Elders believe that a male grizzly bear will not bother a human woman if she says, “Brother-in-law, it’s your sister-in-law here!” (Gwich’in Elders 1997: 66). In this vein, some Gwich’in believe that killing a grizzly bear is the equivalent of killing a human being (Gwich’in Elders 1997). It is thought that in the past grizzly bears were similar to people, and that powerful shamans had the ability to change between human and grizzly bear form (Gwich’in Elders 1997).

The Gwich’in warn of not disrespecting grizzly bears. This includes avoiding talking inappropriately (‘talking smart’) about grizzly bears whether or not they are present (Bullock 1987; Haszard and Shaw 2000; Abraham Peterson in Lambert-Koizumi 2012). It is said that grizzly bears are intelligent and always listening, even during hibernation (Bullock 1987; Abe Steward Sr. in Lambert-Koizumi 2012). The Gwich’in believe that grizzly bears understand all human languages (Gwich’in Elders 1997). Mabel English explains:

“Just be very careful what you say about grizzly bears and have lots of respect for them when you handle them. Even when you’re eating, always say ‘Thank you’” (Gwich’in Environmental Knowledge Project [GEKP] in Gwich’in Elders 1997: 64).

³ In ICC *et al.* (2006), all interviews are coded but not identified by person to ensure anonymity of respondents.

⁴ TO36 in ICC *et al.* (2006: 11-43): “Brown bears, black and grizzly bears – the ones eating willows – you could smell them [cooking]. The ones that eat berries, boy they’re good meat and I’ve hunted all these.”

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The amount of respect afforded to grizzly bears may mean that some scientific practices, such as collaring, marking, or tagging bears, are considered disrespectful to the animal (Clark 1996; Gwich'in Elders 1997).

Gwich'in respect grizzly bears by leaving them alone when they are encountered, unless they are being bothersome, and by being properly prepared when hunting them (GSCI and GRRB 2014). Hunting preparation includes having the appropriate tools, using good practice when butchering and disposing of waste, and not stepping over the bear or its parts (GSCI and GRRB 2014). The Gwich'in traditionally used all parts of the animal, including all of the meat⁵:

“...you just can't shoot a bear and leave it. You just can't shoot a bear and just take the skin and leave the meat. You got to take everything, [that's] what people did in the past, if they wanted a bear they get it, and they use it, use it up the whole thing” (Robert Alexie Sr. in GSCI and GRRB 2014: 43).

In the past, killing a grizzly bear was considered a great event. People would sing and chant in honour of the bear and a special ceremonial feast was held in which women could not attend:

“A boy became a full-grown man only after he killed a shih (grizzly bear), preferably a big one with long, heavy claws. He wore the claws as a symbol of his manhood and strength” (Gwich'in Elders 1997: 67).

Grizzly bears were hunted by groups of men, though women did sometimes take part in a hunt (Gwich'in Elders 1997). The hunt was conducted with great respect, knowing that it could be dangerous. Hunters would say a prayer and ask to be protected, and they did not talk about the grizzly bear or the plans for the hunt⁶, believing that the grizzly bear must 'come' to the hunters in order to be hunted (Gwich'in Elders 1997). Single large animals without cubs were chosen for the hunt, and denning bears were not hunted (Bullock 1987).

For meat purposes, younger bears may have been preferred over older animals (John Norbert in GSCI and GRRB 2014), and the meat of grizzly bears killed in the spring was not considered as

⁵ There is concern that today when grizzly bears are hunted, sometimes the skins are taken but the carcass is left on the land (Woody Elias and Freddy Furlong in GSCI and GRRB 2014). Sometimes bears may be hunted for specific organs or body parts such as the gall bladder (William Teya, GEKP 1996-97 in GSCI and GRRB 2014).

⁶ Bullock (1987: 5) recorded traditional folklore suggesting that speaking about hunting a grizzly bear would result in bad luck for the hunt (i.e., have bad consequences): “[A Gwich'in] belief involved hunting in the late fall. If you (or the hunting group) have located an occupied den, say nothing to anyone about it. If silence is broken the bear will become sick overnight losing all summer fat and when you return the next day for the kill, it will be in poor shape.”

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good⁷ (Mabel English, GEKP 1996-97 *in* GSCI and GRRB 2014). Grizzly bears hunted in the fall⁸, before hibernation, were considered to yield the best meat:

“...they're really fat and they're eating fresh stuff in the fall, so [just] about anything is good eating...like fresh berries” (Eddy McLeod *in* GSCI and GRRB 2014: 45).

Grizzly bears were hunted for meat only when there was no other food source⁹ (Bullock 1987; Haszard and Shaw 2000), or if it was a problem bear (Gwich'in Elders 1997; GSCI and GRRB 2014). One bear yielded meat that “lasted a long time” and two bears “enough for the entire year” (Gwich'in Elders 1997: 67). Grizzly bear meat is not eaten today (GSCI and GRRB 2014), although it is used as dog food (Noel Andre *in* GSCI and GRRB 2014).

In the past, the meat was divided up and some of it was given away (Elizabeth Greenland, GEKP 1996-97 and Robert Alexie Sr. *both in* GSCI and GRRB 2014). Some people did not eat it, thinking that such an act brought misfortune (Gwich'in Elders 1997). The meat was boiled and fried, and the ribs were roasted in the fire (Gwich'in Elders 1997). “The feet were considered a delicacy” (Eddy McLeod *in* GSCI and GRRB 2014: 45). The fat “was rendered into lard and was considered the most valuable part of the animal¹⁰” (Robert Alexie Sr. *in* GSCI and GRRB 2014: 45). Grizzly bear guts were used to store the rendered grizzly bear fat (Bella Alexie, COPE Story *in* GSCI and GRRB 2014), and in the summer both the meat and fat were dried¹¹ and smoked (Elizabeth Greenland, GEKP 1996-97 *in* Gwich'in Elders 1997: 68). The lard was appreciated because it had no aftertaste, and was used to make bannock (Gwich'in Elders 1997). If the intestines were not used, they, and the bones were properly disposed of, perhaps by burning them (Elizabeth Greenland, GEKP 1996-97 *in* GSCI and GRRB 2014). An unnamed Aklavik hunter noted “the practice of carving fish hooks from the canine teeth of brown bear[s]” (Bullock 1987: 7).

⁷ Mabel English, GEKP 1996-97 *in* GSCI and GRRB (2014: 45): “Somebody was telling me that her husband shot grizzly in the spring time and they cut the meat and they start to fry it, it was so awful smell. But you see, there I learned something, because when the bear is in the den, you know...because it don't wake up and, you know, the urine and everything goes into the body ah. So that is why it smells really bad.”

⁸ Bullock (1987) notes that bears were traditionally hunted in late fall.

⁹ Abe Peterson *in* GSCI and GRRB (2014: 44): “Because it's hard to get caribou sometimes, and [so] they kill a nice fat grizzly bear, big grizzly bear, it's good meat [when you] smoke it...clean you know [it's] a clean animal, just kill a ground squirrel and eat roots and caribou meat, fish.”

¹⁰ “[It] can be used for cooking and...is as nice as lard – doughnuts and bannock fried in the fat are particularly nice” (Abe Peterson *in* GSCI and GRRB 2014: 45).

¹¹ “I know the meat they dry it, they dry it and that is the only way we could have it for a while. We don't have freezers, so we have to dry it and then if we want to cook it, we have to put it in water and soak it and then boil it. That is the way we used to keep our meat unless we have an ice house, you know we made a big pit in the ground. That is the only way. Even now...They boil it and they can fry it, and you can roast it to fire, ribs, and they're good. You know that is when you're hungry you kill it, you got no food you can kill it” (Elizabeth Greenland, GEKP 1996-97 *in* GSCI and GRRB 2014: 44-45).

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Grizzly bear fat has medicinal value for the Gwich'in as an ointment, and is rubbed directly on the skin for various maladies ranging from sore throat, rheumatism and arthritis, to hair loss (Gwich'in Elders 1997; GSCI and GRRB 2014).

In the past grizzly bear skins¹² were used “to make clothing¹³, mattresses, rugs or mats, sleigh packs, and other items¹⁴” (Antoine Andre and William Teya, GEKP 1996-97; Alfred Semple, Gwich'in knowledge study on Dall sheep, grizzly bear, and wolf interactions [DSGBW] 2006-11 *all in* GSCI and GRRB 2014: 44). They were not sold as no one would purchase them (Gwich'in Elders 1997). In modern times¹⁵ the hide is tanned and sold (Bullock 1987), kept, or given away (RWED 2003), or made into traditional items such as mitts, parka trimmings, and mukluks (Gwich'in Elders 1997).

The Sahtú

For the people of the Sahtú – the Sahtúgot'ine – all parts of the environment, living or not, are considered interconnected; it is the responsibility of the Sahtúgot'ine to sustain this interconnectedness (Stevenson 2007). Although few documented sources are available, grizzly bears figure prominently in the history of the region. For instance, the name Grizzly Bear Mountain came from the story of a Dene shaman and his encounter with a grizzly bear (Hanks 1996). These kinds of shamanic stories are often the source of Dene laws (George Blondin pers. comm. 1996 *in* Hanks 1996). In the stories of the Sahtú, human and grizzly bear transformations are fairly common and the distinction between bear and man is difficult to make (Hanks 1996). As noted by Hanks (1996), “A fight with a medicine bear may actually be a duel with another shaman.”

The Dehcho

In the Dehcho, grizzly bears are considered powerful, culturally significant animals that must always be treated with respect. It is important to never speak ill of them. In the past, grizzly bear hunters would “prop up the grizzly bear's head with a tree to show respect”, with the head facing east while the animal was being skinned (Allaire pers. comm. 2016).

¹² Preparation of the skins involved a lengthy process of drying, smoking, tanning, and additional preparation for use as a specific item(s) prior to sewing (Gwich'in Elders 1997). Sometimes skins were considered too poor to be used (Antoine Andrew and William Teya, GEKP 1996-97; Alfred Semple, DSGBW 2006-11 *all in* GSCI and GRRB 2014).

¹³ “...they use young bear skin for kids' parky or something like that. It's not so long hair and not so thick” (Gabe Andrew, GEKP 1996-97 *in* GSCI and GRRB 2014: 44).

¹⁴ Sometimes the fur was removed to create a strong leather that was used to make dog harnesses and traces (Thomas Mitchell, GEKP 1996-97 *in* GSCI and GRRB 2014: 44).

¹⁵ Bullock (1987: 2) noted that the trend of hunters showing “an increased interest in shooting grizzly bears, primarily for the resale of tanned hides” took place within a decade (i.e., between 1977-1987).

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The Akaitcho

For the Denesuline of Łutsel K'e, grizzly bears are highly respected, being thought of as spiritually powerful and sharing characteristics with humans¹⁶ (LKDFN 2001, 2015). They are simultaneously seen as being both dangerous and nurturing (LKDFN 2001)¹⁷. They are considered a 'key species' of the Denesuline landscape¹⁸, with changes in the behaviour of grizzly bears considered to be indicative of wide changes in the ecosystem (LKDFN 2001). Further discussion of this is included in *Diet and feeding behaviour*, p. 46 and *Grizzly bear – human interactions*, p. 55. Grizzly bear was a source of meat for the Denesuline (De Beers Canada Inc. 2010), but at least in Łutsel K'e, don't appear to be harvested much anymore (LKDFN 2015).

Traditionally, members of the Deninu Kue First Nation from Fort Resolution would travel together on the land when they hunted, helping one another and hunting for 'everything' as they went, including grizzly bears (De Beers Canada Inc. 2010). Bears would have been harvested using traps, which were set in the late summer and throughout the fall, coinciding with the ripening of berries (Fort Resolution Elders 1987). Harvested bears were used primarily for medicine (the fat can be used to heal people); their meat is not eaten (LKDFN 2015).

SPECIES OVERVIEW

Names and classification

Common Name (English)	Grizzly bear
Common Name – Other:	Barren-ground bears, timber bears (LKDFN 2015)
Common Name – French:	Ours grizzli
Scientific Name	<i>Ursus arctos</i>
Chipewyan	Dléze – grizzly bear (Chipewyan, Łutsel K'e dialect) (South Slave Divisional Education Council [SSDEC] 2014)

¹⁶ One individual indicated that grizzly bears are considered similar to "a person that once lived" while others noted that people could communicate with grizzly bears using the Denesuline language (LKDFN 2015).

¹⁷ This is illustrated in a story told by the Denesuline in which a bear with powerful medicine finds a young man in the fall and coaxes him into his den to hibernate during the winter – the bear was so spiritually powerful that the young man was said not to be able to refuse the bear (Jim Fatt *in* LKDFN 2001). In the end, the presence of the young man caused the bear to be killed and eaten, leaving the young man with an intimate knowledge of where bears hibernate and which were in 'good shape' (i.e., fat) for eating (Jim Fatt *in* LKDFN 2001).

¹⁸ The Denesuline refer to this landscape as Katthinene – meaning 'the area at the end of the (Great Slave) lake', and refers to the area of Denesuline Nene (Chipewyan Land), which is described as being rich in resources (LKDFN 2001).

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	Sas – bear (Chipewyan, Deninu Kue dialect) (SSDEC 2012)
Gwich'in	Shih (Teetl'it Gwich'in dialect) (GSCI and GRRB 2014) Sheh (Gwichya Gwich'in dialect) (GSCI and GRRB 2014) Atsanh (Teetl'it Gwich'in dialect) - ice-covered bear; bears that go into water in the fall and allow the water to freeze, providing a protective layer of ice (Gwich'in Language Centre 2005; GSCI and GRRB 2014)
Inuvialuktun	Akmaq – a (one) grizzly bear (Uummarmiut dialect) (ICC <i>et al.</i> 2006; WMAC (North Slope) and Aklavik Hunters and Trappers Committee [HTC] 2008) Aklak – two grizzly bears (Siglitun and Uummarmiut dialects) (ICC <i>et al.</i> 2006; WMAC (North Slope) and Aklavik HTC 2008) Aklat – three or more grizzly bears (Siglitun and Uummarmiut dialects) (ICC <i>et al.</i> 2006; WMAC (North Slope) and Aklavik HTC 2008) Akhaq (Kangiryuarmitun dialect) (Joint Secretariat 2015) Aghak – brown bear (Inuinnaqtun dialect) (Inuvialuit Joint Secretariat and Species at Risk Secretariat 2011) Aklak – brown bear (Siglitun dialect) (Inuvialuit Joint Secretariat and Species at Risk Secretariat 2011)
Sahtú	Sahcho (Shúhta or Shíhta Got'ine, Déljine Got'ine), sahsho (K'ásho Got'ine) – grizzly usually found in their area (ʔehdzo Got'ine Gots'é Nákedí (Sahtú Renewable Resources Board) [SRRB] and Species at Risk Secretariat [SARS] 2013) Gokw'ı́ sahcho káyelə (Déljine Got'ine), gokw'ı́ sahcho kárelə (Shúhta or Shíhta Got'ine), gow'ı́ sahsho káyelə (K'ásho Got'ine) – a larger grizzly that has started to come into the Sahtú (SRRB and SARS 2013) Gokw'ı́ sahcho káyelə kálə (Déljine Got'ine), gokw'ı́ sahcho kárelə kálə (Shúhta or Shíhta Got'ine), gow'ı́ sahsho káyelə kálə (K'ásho Got'ine) – an even larger grizzly that sometimes has sand on its forearms because it drags cubs out of their den (SRRB and SARS 2013)
South Slavey	Sahcho – grizzly bear (Kátł'odehche dialect) (SSDEC 2009)

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Tł̨chq	Sah dek'oo – brown bear/grizzly bear (Tł̨chq Community Services Agency [TCSA] 2006)
	Sahcho – big bear/grizzly bear (TCSA 2006)
	Sahtso – big bear/grizzly bear (TCSA 2006)

Description

Grizzly bears are large bears with a thick, brown, glossy coat. Their coat colour can vary from light blond with a silver or cream-yellow sheen, to dark brown, to a rare cinnamon colour (Gwich'in Elders 1997; GSCI and GRRB 2014). They have a prominent 'hump' on their shoulders, and their fur has a distinct 'grizzled' appearance as a result of coat hairs having lighter silver or blond hair tips. In June, grizzly bears shed their coats, temporarily lending them a shaggy, dull, and 'grey' appearance (Gwich'in Elders 1997; GSCI and GRRB 2014). By the fall, they have grown a new coat. This new coat may have a different colour than the previous one (GSCI and GRRB 2014). It is also possible for grizzly bears to shed before winter, growing a new coat throughout the winter before they emerge in the spring (GSCI and GRRB 2014). Throughout the spring, summer, and autumn, their coat may exhibit bald patches earned through rubbing or fighting (GSCI and GRRB 2014).

Grizzly bears have a distinctive gait or walk (GSCI and GRRB 2014) that is sometimes compared to the gait of wolverines (Community Corporations of Aklavik, Inuvik and Tuktoyaktuk 2006). They leave behind large and deep tracks, with prints clearly showing toe nails (GSCI and GRRB 2014). Grizzly bears dig in the soil with these large claws, which are sometimes up to 5-8 centimeters (cm) long (Gwich'in Elders 1997; GSCI and GRRB 2014; LKDFN 2015). They move quickly for their size (reaching speeds up to 90 km/hr; LKDFN 2015), which can range from 5-8 feet (1.5-2.4 meters) in length (GSCI and GRRB 2014). Grizzly bears can weigh up to 450 kilograms (kg), and measure 1.2-1.5 meters at the shoulder. Standing on its hind legs, a grizzly bear can reach as tall as 3.4-3.7 meters in height. Male grizzly bears have a larger and stouter appearance as compared to female grizzly bears (Gwich'in Elders 1997; GSCI and GRRB 2014). Łutsel K'e Dene describe grizzly bears as 'huge', but still smaller than polar bears (LKDFN 2015).

The Gwich'in distinguish different sizes of grizzly bears based on their preferred habitat: bears in the Mackenzie Delta and northern Yukon are said to be smaller than those found in the mountains, Alaska, and around Dawson (GSCI and GRRB 2014).

Grizzly bears are known to have an excellent sense of smell but poor eyesight (GSCI and GRRB 2014). Their sense of smell is considered to be stronger 'within their own territory' and some individuals have commented that grizzly bears are particularly sensitive to the smell of cooked food (LKDFN 2015).

Distribution

Grizzly bears have a large range and are found in Asia, Europe, and North America (Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2012). In Canada, they are found in the NWT, Yukon, Nunavut, British Columbia, Alberta, and Manitoba (COSEWIC 2012).



Figure 1. Grizzly bear distribution across the NWT (hatched lines represent areas of increased presence). Map courtesy B. Fournier, Environment and Natural Resources (ENR).

NWT distribution

Grizzly bears inhabit mountainous terrain (i.e., the Mackenzie Mountain range, the Richardson Mountains), the Mackenzie Delta, along the coast, and the barrenlands up to and including the treeline (Figure 1, above). This distribution extends across the mid-northern portion of the territory (to the coast), as well as the mountainous regions of the NWT. Population groups (i.e., Delta grizzly bears, mountain grizzly bears [Mackenzie Mountains and Richardson Mountains], barren-land grizzly bears) are not considered distinct, although they may be discussed separately because of geography (i.e., very long distances, mountain ranges) or habitat preference

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(COSEWIC 2012).

Inuvialuit Settlement Region

Grizzly bears are found throughout the ISR¹⁹, especially the Richardson Mountains and Mackenzie Delta (RWED 2003; ICC *et al.* 2006), with some range expansion occurring on the Arctic islands (see *Trends and Fluctuations*, p. 61, for further details). It should be noted that Aklavik means “place where someone harvested a grizzly bear” (ICC *et al.* 2006: 5-8). Figure 2 (p. 35) shows grizzly bear kills between 2009-2014 in the Inuvik region, broken down by type of kill (i.e., subsistence, sport, problem bear, and illegal kill).

In RWED (2003), 224 knowledge holders in Tuktoyaktuk, Aklavik, Fort McPherson, Inuvik, and Paulatuk were asked whether or not they had observed grizzly bears or grizzly bear signs on the land between the years 1950-2000. Of those interviewees that had observed grizzly bears, the majority of the sightings were “made in the Mackenzie Delta, along the north coast towards Herschel Island, on Richards Island and the Tuktoyaktuk Peninsula, in the Husky Lake area, and along the coast of Darnley Bay” (RWED 2003: 10). Paulatuk’s Community Conservation Plan (Community of Paulatuk *et al.* 2008) identifies important grizzly bear harvesting areas that still retain their use; for example, the Parry Peninsula, west to the mouth of the Horton River, south along the west side of the Horton River, south to the west side of Simpson Lake at the ISR boundary, east to the Horton River, north to the Hornaday River, and east along the coastal zone to the ISR boundary. In the western ISR, documented Inuvialuit observations of grizzly bears are concentrated in the eastern Mackenzie Delta area, nears Hans Bay and Beluga Bay (ICC *et al.* 2006). Den locations can be found all over the mainland ISR, but Inuvialuit in the western ISR make note of some areas in particular: coast of Beluga Bay, around Camp Farewell, Richards Island, Parsons Lake, west of Sitidgi Lake, Sleepy Mountain, Strokes Point, Fish Hole, and inland from Shingle Point (RWED 2003; ICC *et al.* 2006) (see *Appendix A*, p. 145, for more information on grizzly bear observations in the western ISR).

¹⁹ TO20 in ICC *et al.* (2006: 11-40): “I still harvest grizzly bear and polar bear. Grizzly bear... is in the whole ISR.”

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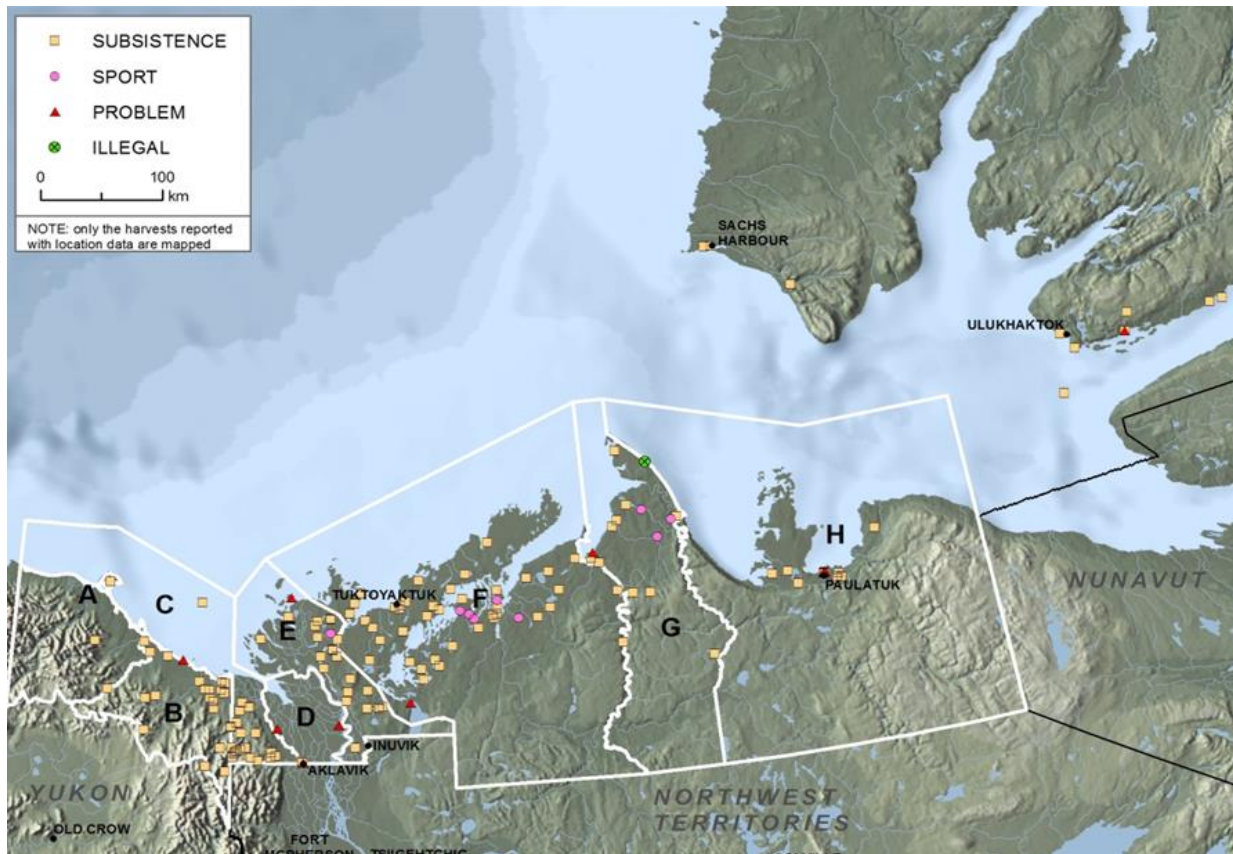


Figure 2. Distribution of harvest/kill locations of grizzly bear in the ISR between 2009-10 and 2013-14. Lettered areas on the map represent: A – Ivvavik National Park; B - Yukon North Slope; C – Aklavik; D – Aklavik-Inuvik; E – Inuvik; F – Tuktoyaktuk-West; G – Tuktoyaktuk-East; and H – Paulatuk. Reproduced from Environment and Natural Resources [ENR] (2014b), with permission.

Gwich'in Settlement Area

Gwich'in Words About The Land (Gwich'in Elders 1997: 66) notes that “most of the time...[grizzly bears] are spread throughout the country”, though they may “gather in a good part of the country” where food is particularly abundant. The GSCI and GRRB (2014) note that grizzly bears can be found throughout the Richardson Mountains and Mackenzie Delta, though it is thought that there are more grizzly bears in the Richardson Mountains (Lambert-Koizumi 2012; Eddie Greenland, Eddy McLeod, and Walter Alexie *in* GSCI and GRRB 2014; John Carmichael, DSGBW 2006-11 *in* GSCI and GRRB 2014). See *Appendix A* (p. 148) for details on recorded grizzly bear locations by the Gwich'in of the GSA.

In general, grizzly bears in the GSA are observed predominantly in the area between the Richardson Mountains and the Mackenzie River, in particular from Bear Creek and Rat River in the south to Aklavik in the north (Bullock 1987; Gwich'in Elders 1997; Haszard and Shaw 2000; Lambert-Koizumi 2012; GSCI and GRRB 2014). Figure 3 (p. 36) shows grizzly bear kills between 2011-2014 in the Inuvik region, broken down by type of kill (i.e., problem bear and subsistence). Please note overlap in symbols for problem bears (pink triangles) – there were six

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problem bears killed between 2011-2014; five north of the Mackenzie River (Inuvik) and one in the Mackenzie Mountains.

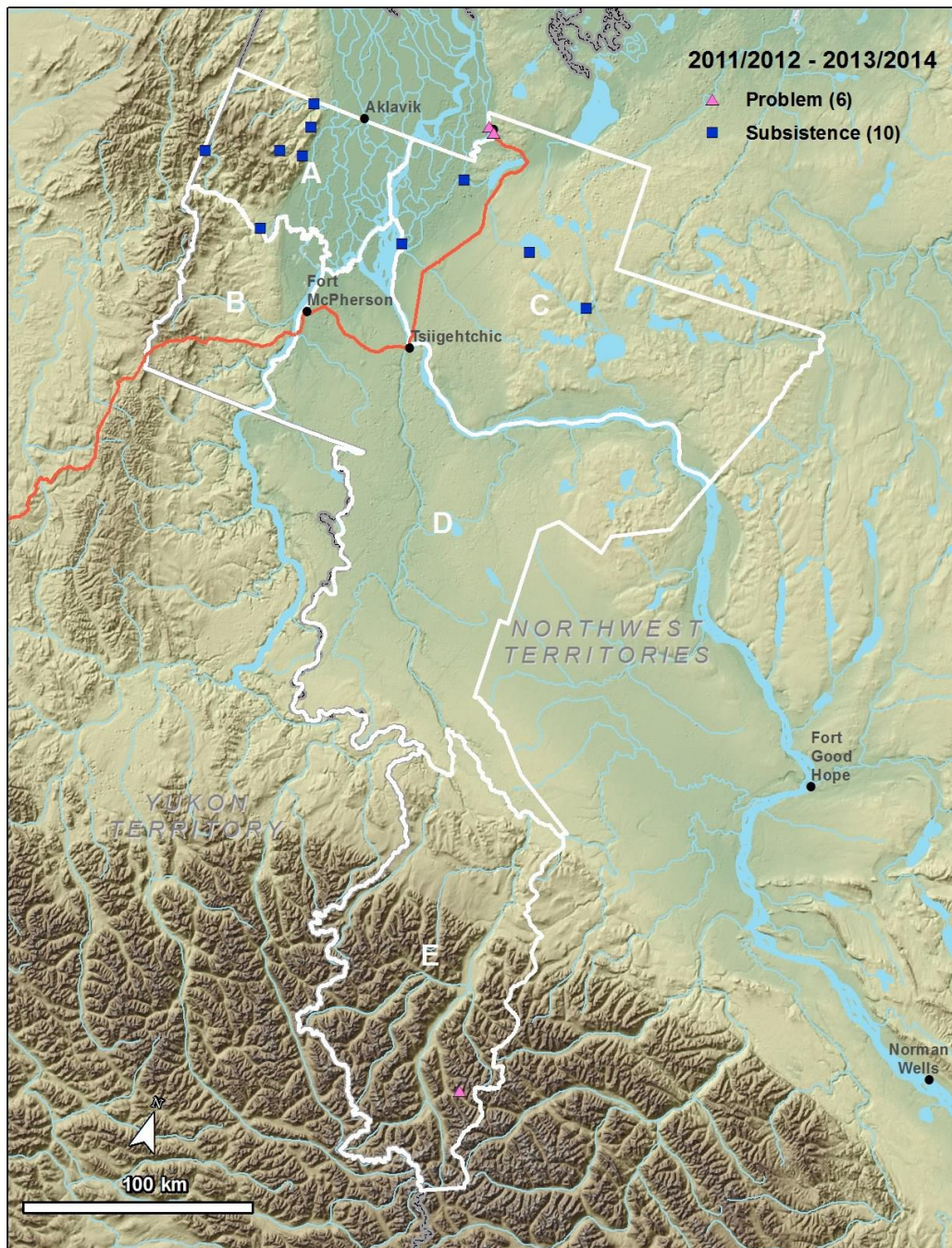


Figure 3. Distribution of reported grizzly bear harvest and kill locations in the GSA between July 2011-June 2014. Lettered areas on the map represent: A – Richardson Mountains North; B – Richardson Mountains South; C – north of the Mackenzie River; D – south of the Mackenzie River; and E – Mackenzie Mountains. Please note overlap in symbols for bears killed as the result of grizzly bear-human interactions (pink triangles) – there were six bears killed between 2011-2014; five north of the Mackenzie River (Inuvik) and one in the Mackenzie Mountains. Reproduced from ENR (2014a), with permission.

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Eastern Sahtú Settlement Area

Berger (1977) noted that grizzly bears inhabit the Mackenzie Valley (defined by the natural travel corridor that is the Mackenzie River and including the NWT portion of the Mackenzie drainage basin, which is to say, all of the western NWT) in varying densities. East of the Mackenzie Mountains, grizzly bears are found throughout the Sahtú Settlement Area (Auld and Kershaw 2005; Sahtú Land Use Planning Board [SLUPB] 2013). According to Auld and Kershaw (2005) there are ‘few’ grizzly bears in this area, compared to the Mackenzie Mountains where they are ‘common’.

Mackenzie Mountains

A relatively high density of grizzly bears is known to occur in the Mackenzie Mountain barrens (Popko and Veitch 2006 pers. comm. *in* Wilson and Haas 2012) and in the Naats’ihch’oh area (around the headwaters of the South Nahanni River; SLUPB 2013). In the Dehcho portion of the Mackenzie Mountains, there is a relatively high density of grizzly bears in the Greater Nahanni area (Dehcho Regional Wildlife Workshop 2008 *in* Wilson and Haas 2012). An additional area in the Backbone Ranges of the Mackenzie Mountains was mapped as a high use area for grizzly bears, at a workshop that included biologists and community harvesters (Dehcho Wildlife Workshop Group 2006 unpubl. data *in* Wilson and Haas 2012; Wiebe 2003).

Slave Geological Province

The 300,000 square kilometer (km²) West Kitikmeot/Slave area, stretching from the north and east arms of Great Slave Lake to the arctic coast, is known grizzly bear range²⁰ (West Kitikmeot Slave Study Society [WKSSS] 2001). The Denesuline of Łutsel K’e particularly note the region of land surrounding Aylmer Lake as being “rich in wildlife, with many sandy eskers providing habitat for grizzly bears, wolves, and other tundra mammals” (LKDFN 2003: 26; Łutsel K’e Dene Community Members 2005: 10). Most Łutsel K’e Dene First Nation (LKDFN) observations of grizzly bears have been north of Łutsel K’e (e.g., Lockhart River), but grizzly bears have also been observed east of the community near McLeod Bay, Fort Reliance, and as far as Whitefish Lake (LKDFN 2015).

Other

Traditional and community knowledge also suggests grizzly bears may have occurred in the Cameron Hills (southern Dehcho region) in the past, and perhaps as recently as the late 1990s (Allaire pers. comm. 2016 and Hordal pers. comm. 2016).

²⁰ The NWT portion of the West Kitikmeot, largely composed of the Taiga Shield ecozone, finishes at the NWT-Nunavut border.

Search effort

Inuvialuit, Gwich'in, and Denesuline knowledge holders have an in-depth understanding of where grizzly bears can be found. This knowledge has been communicated from generation to generation²¹ and is recorded. While other Aboriginal groups most certainly have this information, the sources examined reveal that it is not recorded to the same extent (see *Source summary and gaps/omissions*, p. 23).

Denesuline (Łutsel K'e) observations of grizzly bears have often been during hunting trips, in camps, or while travelling for other reasons (including, more recently, from helicopters while conducting wildlife surveys) (LKDFN 2015). In the ISR and GSA, hunters use boats and skidoos, following ice roads and trails, to hunt grizzly bears. There may be designated trails specifically for this purpose²², or grizzly bears may be hunted incidentally when other species are being harvested^{23,24,25}. INU133 (ICC *et al.* 2006) mentioned grizzly bears are hunted because they have dens near to human camps. Clark and Slocombe (2011) noted that economic factors such as the cost of gas or the price of hides affected how far and how frequently land users were travelling on the land, as well as whether or not they were willing to hunt grizzly bears.

In traditional Inuvialuit 'seasonal' land use, grizzly bears were/are hunted in the spring (ICC *et al.* 2006). The majority of grizzly bear harvests still occur in the spring (April and May), although grizzly bear hunts are also known to take place from spring through to October (ICC *et al.* 2006). Knowledge holders note that in the past, grizzly bears were hunted all year long by the Inuvialuit, even when they were denning (ICC *et al.* 2006). This required specific knowledge and techniques (ICC *et al.* 2006).

It is mentioned several times in the Inuit Land Use and Occupancy Project (Milton MR Freeman 1976) that in the past, grizzly bears on the barrenlands were so scarce that they were hunted only incidentally. Finding tracks or signs of a bear was such a rare occurrence that when signs were spotted they were followed, even for very long distances, and even when it was difficult.

²¹ One hunter who had learned to hunt from his father commented that: “[Now] I’m the one leading the skidoos, going for grizzly bears, polar bears...I’m the one that’s breaking trail to...Yukon North Slope...to the coast because I know the way.” (AK236 in ICC *et al.* 2006: 11-34)

²² TO06 in ICC *et al.* (2006: 11-42): “My trail is my old trap line trail to hunt grizzlies.”

²³ TO109 in ICC *et al.* (2006: 11-42): “Wolves and wolverine too, while we look for grizzly, right from Holmes Creek to Parsons Lake.”

²⁴ TO53 in ICC *et al.* (2006: 11-42): “Grizzlies are also sometimes hunted by boat, at the same time as hunting seals or picking berries.”

²⁵ PIN 19, Aklavik in Joint Secretariat (2015: 30): “If I go to the coast...I’m going to be hunting the polar bears, doing my hunt on the ice, and I’ve also got a grizzly bear tag.” Knowledge holders in Joint Secretariat (2015) are assigned unique Participant Identification Numbers (i.e., PIN 19) instead of being identified by name, thereby preserving anonymity.

Status of Grizzly Bear in the NWT – Traditional and Community Knowledge

“As soon as we see bear tracks we would follow them, even in deep snow. Sometimes we don’t catch up to the grizzly bears but [a] lot of times we do catch up to them. [Old time hunters] would follow them using snowshoes and [a] dog team” (INU110 in ICC et al. 2006: 11-42).

Biology and behaviour

Habitat requirements

Grizzly bears prefer certain kinds of habitat. They prefer areas that are ‘open’, have abundant food resources, and are not too warm during the summer months. The Mackenzie Delta, for example, is considered less suitable habitat than the Richardson Mountains because there are more mosquitos in the summer (Gwich’in Elders 1997), more brush (i.e., it is not as ‘open’), and there may not be as many food resources available. Females with cubs may choose brushier areas however, to provide cover for the cubs that more open areas cannot (Lambert-Koizumi 2012).

Shade and the particular habitat created by eskers on the barrenlands appear to be important in the summer, as is noted by a Denesuline knowledge holder:

“Those little bushes, T’a bathe (bog birch), that is where the bears stay in the summer, in the shade. That’s why it is said to never go downhill of eskers quickly because bears might be there” (LE, LKDFN 2001a: 17 in De Beers Canada Inc. 2010: 5-51).

In addition to providing shade and shelter, eskers are also noted for supporting “a varied plant life, [which] attracts animals such as caribou and grizzly bear[s].” (De Beers Canada Inc. 2010: 5-69).

Food resources

Whether or not food is abundant and available is a major factor driving grizzly bear habitat selection (Lambert-Koizumi 2012). If an area is abundant in important food sources, such as berries, roots, caribou, or ground squirrels, it will be attractive to grizzly bears (Lambert-Koizumi 2012; LKDFN 2015). Inuvialuit knowledge holders note a relationship between increases in the number of grizzly bears in an area corresponding to an increase in the population of animal food species²⁶ (ICC et al. 2006).

Gwich’in Elders call the Richardson Mountains ‘bear country’ (Gwich’in Elders 1997), because they have abundant and numerous food resources and the potential for early thaw in the spring (with early snow melt in the mountains and the wind clearing snow). This early thaw and exposure can help bears find vegetation with relative ease. Aside from abundant roots and

²⁶ TO07 (ICC et al. 2006) notes: “There are more brown bears [in the Tuktuuyaqtuuq area] because there are more caribou.”

Status of Grizzly Bear in the NWT – Traditional and Community Knowledge

berries, ground squirrels thrive in the Richardson Mountains, and there is fishing and fast water, which grizzly bears can use to hunt prey (more details are included in *Diet and feeding behaviour*, p. 46) (Gwich'in Elders 1997). Large flat areas with an abundance of berries are sometimes frequented by several bears at the same time (i.e., Black Mountain) (Abe Stewart, DSGBW 2006-11 in GSCI and GRRB 2014).

More details can be found in *Diet and feeding behaviour*, p. 46.

Denning

Berger (1977) noted that knowledge holders had talked about certain critical habitat characteristics necessary near denning sites. These sites were typically “found on high well-drained slopes” (Berger 1977: 100). Den building requires loose substrate suitable for digging, and a favourable slope orientation. Bears may try to build their dens near a water source, such as a creek or near the gravel beach of a lake (GSCI and GRRB 2014). South facing slopes, small hills, and steep lake banks are ideal den locations (GSCI and GRRB 2014; Nirlungayuk 2011). Bears have been known to create temporary warm spring sleeping locations as well, excavating spaces in the snow and lining them with grass (Woody Elias, DSGBW 2006-11 in GSCI and GRRB 2014). Trees and vegetation mats near den locations may provide bedding material and materials to block the door of a den (McLoughlin pers. comm. 2014²⁷), with willows being cited as bedding material in Nunavut (Nirlungayuk 2011). Dens may be of a size to allow grizzly bears to move around in them during the winter if needed, and may even be high enough for the bear to stand up in (Gwich'in Elders 1997). Dens built in flatter areas can resemble a hill, or they may be dug more deeply in the ground (Gwich'in Elders 1997). Grizzly bears may also use caves for denning (Gwich'in Elders 1997; Nirlungayuk 2011).

The Denesuline of Łutsel K'e suggest that grizzly bears do not build their dens directly on eskers, but rather near eskers where conditions are more ideal:

“The grizzly bears, from what I have seen, never have their dens on the eskers. They have their dens on the outskirts of the eskers where there are these small patches of hilly sand. And another thing too is that they don't make their dens on the south side, only on the west side where the wind blows” (LD, LKDFN 2001a: 27 in De Beers Canada Inc. 2010: 5-51).

Movements

Grizzly bears move widely across their habitat for a number of reasons, including searching for food resources, in order to follow favourable climate (e.g., cooler temperatures during the summer months) or conditions (e.g., fewer mosquitos) (Ernest Vittrekwa in GSCI and GRRB 2014), and to “return to good denning territory” (GSCI and GRRB 2014: 32). They have the

²⁷ As relayed to Dr. McLoughlin by a knowledge holder during fieldwork conducted in the Bathurst Inlet area.

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ability to travel by walking great distances without stopping (George Niditchie *in* GSCI and GRRB 2014), although they will stop during these movements if they come across an area with abundant food, such as a caribou herd (Mary Kendi, DSGBW 2006-11 *in* GSCI and GRRB 2014). They are noted to be excellent swimmers (unnamed Aklavik hunter and Eddy McLeod *in* GSCI and GRRB 2014; LKDFN 2015; Nirlungayuk 2011), and adept at manoeuvring in the mountains, including scaling steeper slopes.

Grizzly bears are known to follow caribou herds; for example, the Porcupine caribou herd as it migrates (GSCI and GRRB 2014). Grizzly bears will hunt caribou for themselves and will also scavenge from other kills, including human kills (more details in *Grizzly bear – human interactions*, p. 55) (Lambert-Koizumi 2012). Although following caribou herds could be considered seasonal movement, it is not considered migratory behaviour (GSCI and GRRB 2014). Knowledge holders note that it is mostly males following game (GSCI and GRRB 2014). It is possible that some bears follow the herd full-time (George Niditchie *in* GSCI and GRRB 2014).

Gwich'in Settlement Area

Gwich'in knowledge holders note that “bears are widely dispersed over the Gwich'in Settlement Area and that individual bears travel widely” (Eddie Greenland *in* GSCI and GRRB 2014: 27). Grizzly bear movements within the GSA may be categorized as seasonal, with bears moving “between the Mackenzie Delta and the [Richardson] mountains, especially during high water” (Mabel Kendi, DSGBW 2006-11 and unnamed Aklavik hunter *in* GSCI and GRRB 2014: 32). They travel north during the spring and summer toward the ocean (Eddie Greenland *in* GSCI and GRRB 2014) where a host of conditions, such as cooler temperatures, fewer biting pests (Ernest Vittrekwa *in* GSCI and GRRB 2014), and more abundant food (Walter Alexie *in* GSCI and GRRB 2014) may be found. Bears may spend the spring in the Black Mountain area where food is plentiful (i.e., vegetation and ground squirrels) (Freddie Greenland and John Carmichael, DSGBW 2006-11 *in* GSCI and GRRB 2014), and return in the fall to den in the same area where there are sheep (Dale Semple, DSGBW 2006-11, and Eddie Greenland and Ernest Vittrekwa *all in* GSCI and GRRB 2014). They may travel southwest towards the Rat River watershed from the Black Mountain area in the spring and late summer in order to take advantage of the Dolly Varden char run (Dale Semple, DSGBW 2006-11 *in* GSCI and GRRB 2014).

The same bear may be seen multiple times over the years in one location in the Richardson Mountains (Abe Peterson *in* GSCI and GRRB 2014), presumably because resources are so readily available and there is no need for mountain bears to go very far (Abe Peterson, Ernest Vittrekwa, and George Niditchie *all in* GSCI and GRRB 2014).

Grizzly bears travelling in the Richardson Mountains do not seem to follow trails but “travel all over the place” (Eddie Greenland *in* GSCI and GRRB 2014: 32). It is noted that bears do have routes that they follow between abundant food resources (Woody Elias *in* GSCI and GRRB

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2014). Grizzly bears seem to prefer the protection of wooded areas and creeks, although they will travel across open areas (Eddy McLeod *in* GSCI and GRRB 2014). Males are more likely to venture into open areas (Lloyd Nerysoo, DSGBW 2006-11 *in* GSCI and GRRB 2014).

Grizzly bears travelling in the Mackenzie Delta use river banks and creeks to move around, sometimes creating trails (Eddy McLeod *in* GSCI and GRRB 2014). Such trails are observed along the Kugaluk (William Modest *in* GSCI and GRRB 2014) and Peel rivers (Robert Alexie Sr., DSGBW 2006-11 *in* GSCI and GRRB 2014), and along lake shores “to the east of the Mackenzie Delta and up the Arctic Red River” (Gabe Andre, GEKP 1996-97 and John Norbert *in* GSCI and GRRB 2014: 33).

It has been noted that some creek valleys in the Richardson Mountains are “too steep for...grizzlies to move through...easily, and often boulders are present” (Billy Wilson, DSGBW 2006-11 *in* GSCI and GRRB 2014: 36). This can present a problem for grizzly bears that rely on water crossings to stalk and hunt their prey (more details are included in *Diet and feeding behaviour*, p. 46).

Life cycle and reproduction

Female grizzly bears can begin having cubs at four years of age, sometimes earlier (Gwich'in Elders 1997) and may have 1-2 litters in a season, although when food availability is low, often only one litter is seen (Nirlungayuk 2011). Grizzly bear mothers-to-be enter their dens pregnant and give birth in the den in January or February (Fort McPherson verification session *in* GSCI and GRRB 2014). Grizzly bears have one to three cubs²⁸, with the average being two (GSCI and GRRB 2014; LKDFN 2015). Further north on the coast it may be more common for bears to have one or two young (AK213 *in* ICC *et al.* 2006).

During the spring, after having her young, a female grizzly bear is considered dangerous (ICC *et al.* 2006). Inuvialuit note that in general bears will hunt ravenously at this time, caching successful kills for later (Rufus 1991: 57 *in* ICC *et al.* 2006).

Cubs stay with their mother for two or three years (Lambert-Koizumi 2012; Noel Andre and George Niditchie *in* GSCI and GRRB 2014; LKDFN 2015; Nirlungayuk 2011), during which time they are taught the necessary skills to live on their own. They are taught to hunt and gather food during this time (unnamed Aklavik hunter and Ernest Vittrekwa *in* GSCI and GRRB 2014). Early foods for their first spring include berries left on plants from the previous season (Mabel English, GEKP 1996-97 *in* GSCI and GRRB 2014) and fish, which is softer and easier for them to eat than meat (Thomas Mitchell, GEKP 1996-97 *in* GSCI and GRRB 2014). The cubs stop nursing in the fall (Gwich'in Elders 1997).

²⁸ Three cubs are rare, but when there are three cubs, they are generally of good body condition and not smaller because they come from a larger litter (Eddy McLeod and Walter Alexie *in* GSCI and GRRB 2014).

Status of Grizzly Bear in the NWT – Traditional and Community Knowledge

The cubs follow their mother everywhere (Gwich'in Elders 1997). The mother uses a number of strategies to keep her cubs safe, including separating from her cubs if danger threatens, and if it is necessary to assess a potentially dangerous situation (GSCI and GRRB 2014). For example, mothers have been known to hide their cubs before coming out to take freshly killed game (Ernest Vittrekwa *in* GSCI and GRRB 2014). A mother grizzly bear may also send her cubs up a tree if danger approaches, remaining below to guard them (Gabe Andre, GEKP 1996-97 *in* GSCI and GRRB 2014). When it is safe, the mother will use a special sound to call the cubs back down (Mabel English, GEKP 1996-97 *in* GSCI and GRRB 2014).

It is possible for grizzly bears to have a long lifespan in the wild. Old grizzly bears in the GSA are said to be 30-35 years old, although it is believed that grizzly bears will live until they have no teeth left (Gwich'in Elders 1997). Members of the LKDFN have indicated that on rare occasions, grizzly bears can live to be as old as 100 years (LKDFN 2015). It is not easy to age a bear, but there are methods such as “checking the teeth of a dead bear” (Mabel English, GEKP 1996-97 *in* GSCI and GRRB 2014: 34) and looking at the tracks they leave behind, which become larger as the bear ages and grows (Eddie Greenland *in* GSCI and GRRB 2014).

Older bears with poor teeth have a reputation for being dangerous as they are hungry and unable to hunt²⁹ (Gwich'in Elders 1997; GSCI and GRRB 2014). It is said that they “will go after anything” (Gwich'in Elders 1997: 64). Although they might have slowed down as compared to younger bears, “they can still move very fast” (GSCI and GRRB 2014: 34). As they are unable to gain adequate nutrition, these bears will ultimately starve.

Bears that are about to die may intentionally go off to do so, placing themselves in a den or hole where they might be buried by another grizzly bear:

“Well, after they die, they die in the hole. They put themselves away, where nobody can get a hold of them, not even flies. Some other grizzly come around and just bury them...Just like human beings they bury them, just the same thing” (Antoine Andre, GEKP 1996-97 *in* Gwich'in Elders 1997: 34-35).

Physiology and adaptability

Communication behaviour

Grizzly bears communicate with different sounds. Cubs call to their mothers when separated, making a ‘mama, mama’ sound (Gwich'in Elders 1997; Catherine Mitchell and Antoine Andre, GEKP 1996-97 *in* GSCI and GRRB 2014). Mother bears may make a ‘woo, woo’ sound when danger is near, communicating to their cubs to stay still and quiet (Gwich'in Elders 1997; Gabe

²⁹ “...they're poor, they can't hunt, that's why they get pretty wicked.” (Walter Alexie *in* GSCI and GRRB 2014: 34). Their poor body condition can also mean that they don't taste very good (Walter Alexie *in* GSCI and GRRB 2014).

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Andre and Mabel English, GEKP 1996-97 *in* GSCI and GRRB 2014). Adult grizzly bears make a strong, loud blowing noise (Antoine Andre and Thomas Mitchell, GEKP 1996-97 *in* GSCI and GRRB 2014) and when something threatening comes too close they will growl (Elizabeth Greenland, GEKP 1996-97 *in* GSCI and GRRB 2014). When a male growls it will release “a short deep yell at the end” (Gwich’in Elders 1997: 64).

Grizzly bears mark their territory when travelling about, climbing trees and breaking branches off, or stripping bark from trees (William Teya, GEKP 1996-97 *in* GSCI and GRRB 2014). They also make marks on trees with their claws (Fort McPherson verification session *in* GSCI and GRRB 2014).

Health

The Gwich’in use coat condition to tell whether or not a grizzly bear is healthy. “A nice shiny coat means the bear is healthy” (GSCI and GRRB 2014: 56), whereas an ‘ugly’ coat indicates an unhealthy animal (George Niditchie *in* GSCI and GRRB 2014). The general body condition is also helpful for indicating the health of an animal. A skinny bear may signify hunger or sickness (William Modeste *in* GSCI and GRRB 2014). Grizzly bears are generally thought to have a nice coat when they emerge from their dens in the spring, although they may be in poor shape until they begin eating again (Abe Peterson and Eddie Greenland *in* GSCI and GRRB 2014). In the fall, after gorging through the summer, healthy bears have a “thick layer of fat all over the body, [and] their fur becomes rich” (Gwich’in Elders 1997: 67).

Within the GSA and Akaitcho region, grizzly bears are generally thought to be a healthy animal (Eddy McLeod *in* GSCI and GRRB 2014; LKDFN 2015). It is noted that they are susceptible to internal parasites, as with other animal species (Johnny Charlie, DSGBW 2006-11 *in* GSCI and GRRB 2014)³⁰. Bears may get injured in fights and consequently show injury (Lloyd Nerysoo, DSGBW 2006-11 *in* GSCI and GRRB 2014). It is thought that the presence of a grizzly bear that is not bothering people indicates that the surrounding area has plenty of game and other food, and that the bear itself is healthy and not hungry (Gwich’in Elders 1997). If a grizzly bear tried to attack people, however, it is thought that it is hungry or that something may be wrong with the bear (Gwich’in Elders 1997).

It is thought that “old age may be the most important health issue for bears” (GSCI and GRRB 2014: 57). Old bears with poor teeth face an inability to provide for themselves and may starve (Alfred Semple, DSGBW 2006-11 *in* GSCI and GRRB 2014)³¹. More details about old bears can be found in *Life Cycle and Reproduction*, p. 42.

³⁰ “But all these animals that you talk about, the grizzly bears and the wolves. You got to be careful when you handle them ‘cause they have worms...Like the tapeworms that live in the feces, in scats. And if you step on them, dust comes to the air. You can breathe that.” (Johnny Charlie, DSGBW 2006-11 *in* GSCI and GRRB 2014: 57).

³¹ Alfred Semple once shot a bear stealing from a cache that “was obviously not healthy...[it] had no hair on its belly,...no fat, and ‘no teeth’. It would have likely died soon” (Alfred Semple, DSGBW 2006-11 *in* GSCI and

Status of Grizzly Bear in the NWT – Traditional and Community Knowledge

Ryan McLeod (DSGBW 2006-11 *in* GSCI and GRRB 2014) noted that the reliance of grizzly bears on vegetation explains their slow rate of growth.

Denning

The ground must be thawed enough to allow grizzly bears to dig before they can begin building their dens. They may start in July, digging as much as possible and then leaving the den for several weeks before returning, allowing the ground to thaw further (Bullock 1987; Gwich'in Elders 1997). Females who are pregnant and those with cubs will begin den preparation earlier than males (Eddie Greenland *in* GSCI and GRRB 2014).

Bears will head to their dens when the weather gets cold (-26 to -28°C [William Modeste *in* GSCI and GRRB 2014]), between September and November (Lambert-Koizumi 2012), between October and November (Nirlungayuk 2011), “when there is frost on their humps” (November-December; LKDFN 2015), or “as soon as it snows” (Gwich'in Elders 1997: 64). If the weather is favourable (Ryan McLeod, DSGBW 2006-11 and Abe Wilson *in* GSCI and GRRB 2014), or if food is easily accessible (unnamed Aklavik hunter *in* GSCI and GRRB 2014), bears will stay out longer. Bears that are in very good shape may also be more tolerant to the cold of early winter (i.e., adequate fat stores) and may consequently stay out later (Eddy McLeod *in* GSCI and GRRB 2014). Knowledge holders note that grizzly bears head to their dens later than black bears (GSCI and GRRB 2014). Female grizzly bears have been observed to “leave the garbage dump earlier [in the fall] than males” (Ian McLeod, DSGBW 2006-11 *in* GSCI and GRRB 2014: 30). Males may enter their dens anytime up to December, depending on the weather (Bullock 1987; Lambert-Koizumi 2012). Younger bears are also said to enter their dens earlier than older bears (Walter Alexie *in* GSCI and GRRB 2014).

Bears delay moving into their dens when weather or food conditions are favourable, but also when food resources over the summer season have been inadequate or when they haven't obtained adequate nutrition and are in poor shape for hibernation (John Carmichael, DSGBW 2006-11 and William Modeste *in* GSCI and GRRB 2014) (more details are included in *Habitat requirements*, p. 39 and *Physiology and adaptability*, p. 43).

Knowledge holders note that denning bears generally sleep soundly (William Teya, GEKP 1996-97 *in* GSCI and GRRB 2014), although when they initially enter their dens they may frequently look out, until early November (Gwich'in Elders 1997).

GRRB 2014: 57). Ryan McLeod saw a poor bear that “was really skinny like you could see its ribs right through the fur. It looked older. It must be of something stopping him from eating like maybe something wrong with its teeth or its jaw or something” (Ryan McLeod, DSGBW 2006-11 *in* GSCI and GRRB 2014: 57).

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A den that is suitable may be used for several years, but if the location is not good the grizzly bear may move to a new location the next year, or even at some point during the early winter³² (Gwich'in Elders 1997). Grizzly bears are known to clean their dens (Gwich'in Elders 1997). Female grizzly bears have their cubs in their dens during hibernation and may have more than one den that they use in sequence, leaving behind a soiled or dirty den for a clean one (Gwich'in Elders 1997).

Bears will exit their dens when the weather warms up, as early as March (GSCI and GRRB 2014; Dale Semple, DSGBW 2006-11 *in* GSCI and GRRB 2014), and as late as the beginning of June (Lambert-Koizumi 2012) (LKDFN 2015). By May it is common to see them out of their dens (unnamed Aklavik hunter and Abe Peterson *in* GSCI and GRRB 2014). Several factors may encourage bears to exit their dens including Chinook winds (a warm winter wind that descends the leeward side of mountains) (William Modeste *in* GSCI and GRRB 2014), when they “first hear a shot from a spring-time hunting trip” (Abe Wilson *in* GSCI and GRRB 2014: 31), the noises from ground squirrels (Eddie Greenland *in* GSCI and GRRB 2014), and the sound of melting snow and ice dripping around their den door (Eddy McLeod and Robert Alexie Sr. *in* GSCI and GRRB 2014). TO53 and TO25 (ICC *et al.* 2006: 11-38) observed that: “The bears and their cubs emerge when the water starts running or when the mosquitos emerge in the springtime.” If the weather is warm in the mid-winter, bears may exit their dens, re-entering when the weather gets colder (GSCI and GRRB 2014). This may have been the case in February 2014, when grizzly bear tracks were observed near Whitefish Lake, NWT (LKDFN 2015).

When bears exit their dens in the spring they “may purge by eating a lot of snow, to ‘take the fat off’” (Thomas Mitchell, GEKP 1996-97 *in* GSCI and GRRB 2014: 31). They may be reluctant to leave the location of their den initially, emerging only to hang around the den, moving further away as the weather warms up (William Modeste *in* GSCI and GRRB 2014).

Diet and feeding behaviour

A wide variety of foods are eaten by grizzly bears. Their diet does have regional and seasonal differences, and can depend on available habitat. Tables 1 and 2 (pgs. 47-47) show grizzly bear food sources divided into important food sources and less important food sources³³.

³² Conditions that may cause a grizzly bear to abandon a den and find a new one include if a human has been in a den or if the ground is too cold (Gwich'in Elders 1997).

³³ The distinction between important and less important food resources was largely given in GSCI and GRRB 2014.

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Table 1. Important food sources for grizzly bears as noted by traditional knowledge holders of the NWT. All common and scientific names checked against SARC (2013) for consistency. Food sources are arranged alphabetically by common name.

Food	Scientific name	Source(s)
Meat sources		
Arctic ground squirrel	<i>Urocitellus parryii</i> (mentioned as <i>Spermophilus parryii</i>)	Bullock 1987; Lambert-Koizumi 2012; GSCI and GRRB 2014; Nirlungayuk 2011
Caribou	<i>Rangifer tarandus</i>	Bullock 1987; Lambert-Koizumi 2012; GSCI and GRRB 2014; Nirlungayuk 2011
Fish sources		
Arctic grayling	<i>Thymallus arcticus</i>	Bullock 1987; GSCI and GRRB 2014
Dolly Varden	<i>Salvelinus malma</i>	Lambert-Koizumi 2012; GSCI and GRRB 2014
Northern pike	<i>Esox lucius</i>	GSCI and GRRB 2014
Whitefish ³⁴	<i>Coregonus</i> spp.	Bullock 1987; Barker and Derocher 2009; GSCI and GRRB 2014
Berry sources		
Alpine bilberry (blueberry)	<i>Vaccinium uliginosum</i>	Lambert-Koizumi 2012; GSCI and GRRB 2014; LKDFN 2015
Black crowberry	<i>Empetrum nigrum</i>	GSCI and GRRB 2014
Cloudberry	<i>Rubus chamaemorus</i>	Lambert-Koizumi 2012; GSCI and GRRB 2014; LKDFN 2015
Red osier dogwood berry	<i>Cornus sericea</i>	GSCI and GRRB 2014
Rock cranberry (lingonberry)	<i>Vaccinium vitis-idaea</i>	Lambert-Koizumi 2012; GSCI and GRRB 2014
Rosehip of prickly rose	<i>Rosa acicularis</i>	GSCI and GRRB 2014
Other vegetation sources		
Roots from alpine sweet-vetch (bear roots)	<i>Hedysarum alpinum</i>	GSCI and GRRB 2014

Table 2. Other food sources for grizzly bears as noted by traditional knowledge holders of the NWT. All common and scientific names checked against SARC (2013) for consistency. Food sources are arranged alphabetically by common name.

Food	Scientific name	Source(s)
Meat sources		
Beaver	<i>Castor canadensis</i>	GSCI and GRRB 2014
Common muskrat	<i>Ondatra zibethicus</i>	GSCI and GRRB 2014
Dall sheep	<i>Ovis dalli</i>	GSCI and GRRB 2014; Lambert-Koizumi 2012
Ducks	Sources not specific	GSCI and GRRB 2014

³⁴ Barker and Derocher (2009) make particular mention of broad whitefish (*Coregonus nasus*) as a source of food in the Mackenzie Delta region, with grizzly bear fishing and fish caching observed at Pete's Creek. Though their research was scientific in scope, they note that they were led to investigate this phenomena because of described traditional knowledge for the area. Further, Barker and Derocher (2009) note that grizzly bears in the Delta do not have many readily available sources of protein, and that whitefish may serve as an important food for some bears because of this. The researchers concluded that "proponents of natural gas development in the Mackenzie Delta should consider that we do not fully understand the food resources of brown bears in the area" (Barker and Derocher 2009: 315).

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Food	Scientific name	Source(s)
Hare	<i>Lepus</i> spp.	GSCI and GRRB 2014; Lambert-Koizumi 2012
Insects	Sources not specific	GSCI and GRRB 2014
Whale carrion (killer whales, beluga whales, or bowhead whales)	<i>Orcinus orca</i> , <i>Delphinapterus leucus</i> , <i>Balaena mysticetus</i>	Bullock 1987; Joint Secretariat 2015
Mice	Sources not specific	ICC <i>et al.</i> 2006
Moose	<i>Alces americanus</i>	GSCI and GRRB 2014; Lambert-Koizumi 2012
Muskoxen	<i>Ovibos moschatus</i>	Lambert-Koizumi 2012; PIN 38, Tuktoyaktuk <i>in</i> Joint Secretariat 2015; Nirlungayuk 2011
Brant and Snow geese eggs	<i>Branta bernicla</i> and <i>Chen caerulescens</i>	Community of Aklavik <i>et al.</i> 2008; Community of Inuvik <i>et al.</i> 2008; Community of Paulatuk <i>et al.</i> 2008; Community of Sachs Harbour <i>et al.</i> 2008; Community of Tuktoyaktuk <i>et al.</i> 2008; Community of Ulukhaktok <i>et al.</i> 2008
North American river otter	<i>Lontra canadensis</i>	ICC <i>et al.</i> 2006
Ptarmigan	<i>Lagopus</i> spp.	GSCI and GRRB 2014
Seal pups (rare in NWT)	<i>Erignathus barbatus</i> , <i>Phoca vitulina</i>	Bullock 1987; ICC <i>et al.</i> 2006; PIN 161 <i>in</i> Joint Secretariat 2015
Fish sources		
Inconnu	<i>Stenodus leucichthys</i>	Bullock 1987
Pond smelt	<i>Hypomesus olidus</i>	Bullock 1987
Berry sources		
American silverberry seed	<i>Elaeagnus commutata</i>	Simon pers. comm. (2001) <i>in</i> GSCI and GRRB 2014
Blueberry roots	<i>Vaccinium uliginosum</i>	Allaire pers. comm. 2016 ³⁵
Common bearberry (kinnikinnick)	<i>Arctostaphylos uva-ursi</i>	Lambert-Koizumi 2012; GSCI and GRRB 2014
Currants	<i>Ribes</i> spp.	Nagy <i>et al.</i> 1983
Soapberry (buffalo berry)	<i>Shepherdia canadensis</i>	Allen pers. comm. 2016
Other vegetation sources		
Grass	<i>Graminoid</i> spp. (grasses and sedges)	Gwich'in Elders 1997; Lambert-Koizumi 2012; Joint Secretariat 2015; LKDFN 2015
Shrubs	Sources not specific	Lambert-Koizumi 2012
Willows	<i>Salix</i> spp.	GSCI and GRRB 2014; Lambert-Koizumi 2012

Some food sources are of particular use to grizzly bears before they go into hibernation, including bear root³⁶ (*Hedysarum alpinum*) and red osier dogwood berry (*Cornus sericea*) (GSCI and GRRB 2014). Roots mature (Robert Alexie Sr. *in* GSCI and GRRB 2014) and berries ripen

³⁵ Danny Allaire (pers. comm. 2016) notes, “On the Ram Plateau I have seen areas where grizzlies dug up blueberry plant roots after they ate all of the blueberries. They would leave the roots out to dry and come back a few days later to eat them.”

³⁶ Woody Elias (*in* GSCI and GRRB 2014) witnessed and shot a male bear that had been washing roots after digging them out of the soil, swallowing them whole, presumably filling his stomach before entering his den.

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(Ruth Welsh *in* Andre 2006) in the fall, coinciding with a time when grizzly bears are trying to fatten up for hibernation. It is said that grizzly bears will focus on finding and eating food during late summer and fall (August-September) in order to build up their fat stores (William Teya, GEKP 1996-97 *in* Gwich'in Elders 1997). This includes focusing on hunting (Lloyd Nerysoo, DSGBW 2006-11 and Eddie Greenland *in* GSCI and GRRB 2014) and may result in increases to predatory behaviour (LKDFN 2015). Bears are said to eat more and be less picky about what they are eating at this time (Abe Wilson *in* GSCI and GRRB 2014) as their fat stores will need to last them over the winter while they are hibernating (Elizabeth Greenland, GEKP 1996-97 *in* GSCI and GRRB 2014).

Another critical feeding period is in the spring time when grizzly bears emerge from their dens and adequate food sources may be in short supply. During this time grizzly bears scavenge for whatever is available (Eddy McLeod *in* GSCI and GRRB 2014). They may rely on vegetation during this time, heading to locations where they can more easily access vegetation exposed from the snow, including roots (Robert Alexie Sr. and Freddy Furlong *in* GSCI and GRRB 2014), pussy willows, and last year's berries (George Niditchie, Noel Andre, and William Modeste *in* GSCI and GRRB 2014). Berries are considered an essential food source for grizzly bear survival during this time – for example, grizzly bears in the Richardson Mountains rely on the previous year's berries while waiting for caribou to migrate through (Ernest Vittrekwa *in* GSCI and GRRB 2014). Muskrat may also play an important role in the spring time, with grizzly bears finding and exploiting muskrat push-ups, waiting for the muskrats to emerge before catching them (Abe Peterson *in* GSCI and GRRB 2014). Young muskoxen are also sometimes taken by grizzly bears (LKDFN 2015; Nirlungayuk 2011). In Nunavut, Nirlungayuk (2011) reported that ground squirrels were the preferred food of grizzly bears, allowing them to survive even in the absence of other food sources.

Grizzly bears employ different strategies to hunt prey animals. They are adept at hunting larger land-based prey such as caribou, sheep, and moose. The hunting strategy often adopted is one of observe, sneak, and ambush, with grizzly bears using available resources to their advantage. Gwich'in Elders (1997) indicate that grizzly bears have the ability to outrun caribou, killing the animals by grabbing the backs of their necks, while Thorpe *et al.* (2001) note that grizzly bears are rarely fast enough to be effective predators of caribou (although they are known to hunt them). Grizzly bear predation on barren-ground caribou has been described by traditional knowledge holders during the post-calving season (Soublière 2011) and during the calving period when calves are at their most vulnerable (Thorpe *et al.* 2001; Advisory Committee for Cooperation on Wildlife Management [ACCWM] 2014; Benson 2015).

“I have seen a grizzly chasing a calf once. I caught sight of it as they were disappearing behind a hill. The grizzly probably ate it...” (Paul Omilgoitok [Kitikmeot community unidentified] *in* Thorpe *et al.* 2001: 108).

Caribou from the Porcupine herd near Fort McPherson are thought to be becoming more 'wild'

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due to pressure from predators³⁷ (Abe Peterson *in* GSCI and GRRB 2014). This may make caribou harder for humans to hunt, and it may be keeping caribou from the area (GSCI and GRRB 2014).

Grizzly bears “are always watching [water] crossings for possible opportunities” (John Carmichael, DSGBW 2006-11 *in* GSCI and GRRB 2014: 36), hiding in brush for prey species to come close so that they can attack³⁸. This strategy is employed when a grizzly bear finds an area where sheep (Billy Wilson and Ernest Vittrekwa, DSGBW 2006-11 *in* GSCI and GRRB 2014) or caribou (Billy Wilson, DSGBW 2006-11 and Eddie Greenland *in* GSCI and GRRB 2014) may cross creeks or other water courses. They will wait in areas of good cover for either a herd or a single animal to cross before using a ‘sneak attack’³⁹ approach to capture their prey (Bullock 1987; unnamed Aklavik hunter *in* GSCI and GRRB 2014).

Another hunting strategy is to corner prey species when working against the backdrop of difficult terrain, such as the mountains⁴⁰, or to chase prey into the water⁴¹. They may even employ their cubs to hunt sheep in the mountains:

“And I did see a bear actually hunting sheep, using their cubs...She had two cubs. And she used them for crawling up the hill there, and once [the cubs] scared the sheep, she went around this mountain and she killed on over there...She used her young ones to distract them”
(Dale Semple, DSGBW 2006-11 *in* GSCI and GRRB 2014: 37).

There are observations of grizzly bears attempting to hunt seals on shore ice (P. Ekpakohak *in* Slavik *et al.* 2009; Nirlungayuk 2011; PIN 161, Tuktoyaktuk *in* Joint Secretariat 2015). Grizzly bears use beaver as a food source and have been known to employ different strategies in their hunting, including digging up beaver lodges to get at the beaver, waiting at the entrance of the lodge for the beaver to exit before attacking (Antoine Andre, GEKP 1996-97 *in* GSCI and GRRB 2014), and waiting at the edge of the water where the beaver is known to exit the water, and grabbing it when it does (Gwich’in Elders 1997). They may push smaller trees over to get at animal prey trapped in trees (William Modeste *in* GSCI and GRRB 2014). Grizzly bears are known to dive for fish (Gwich’in Elders 1997) and they will smash up rotten logs or stumps in order to eat ants (Gwich’in Elders 1997). Grizzly bears also use their claws to dig for some food

³⁷ “[Grizzly] bears they’re chasing [the caribou], they could [get] close, but that caribou knows about bears, he knows they’re going to chase him, so they’re wild. As soon as they see bear they just take off” (Abe Peterson *in* GSCI and GRRB 2014: 37).

³⁸ “Grizzlies...hide in willows and wait for caribou to come close” (Charlie Stewart, DSGBW 2006-11 *in* GSCI and GRRB 2014: 36).

³⁹ “...although the rate of success might not be very high” (unnamed Aklavik hunter *in* GSCI and GRRB 2014:36).

⁴⁰ Grizzly bears may try to corner sheep (Abe Peterson, DSGBW 2006-11 *in* GSCI and GRRB 2014). The sheep “may flee to high cliffs” (Billy Wilson, DSGBW 2006-11 *in* GSCI and GRRB 2014: 36) watching the grizzly bear below. John Carmichael (DSGBW 2006-11 *in* GSCI and GRRB 2014: 36) noted: “I have seen the sheep up...part way [and the grizzly bears were] kind of sneaking around and going around. The sheep would be watching them.”

⁴¹ Abe Wilson (*in* GSCI and GRRB 2014: 37) noted seeing “a grizzly bear chase a moose into a river to try and kill it.”

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sources such as bear root (*Hedysarum alpinum*) and ground squirrel (*Urocitellus parryii*), leaving behind characteristic marks in the soil (Eddy McLeod and Robert Alexie Sr. *in* GSCI and GRRB 2014).

Though grizzly bears can be selective about their prey, for example choosing to target caribou that are ‘fat’ (Abe Peterson *in* GSCI and GRRB 2014), they are opportunists and may take advantage of animals that are sick, injured⁴², or very young (i.e., lambs and caribou calves) (Glen Alexie, DSGBW 2006-11 *in* GSCI and GRRB 2014; Nirlungayuk 2011). They may also steal caribou carcasses from wolf kills (LKDFN 2015) and take advantage of caribou being hunted by humans, finishing off caribou wounded in a hunt (Abe Peterson *in* GSCI and GRRB 2014). More details can be found in *Grizzly bear – human interactions*, p. 55.

Grizzly bears will stay in an area when a good supply of food is available (Abe Peterson *in* GSCI and GRRB 2014). After making a kill they may stay around feeding off the carcass (Abe Peterson *in* GSCI and GRRB 2014) or they may cache their food by piling dirt and moss on top of it. These caches may be guarded by the bear. Gwich’in knowledge holders have seen and smelled these caches in the Richardson Mountains around caribou herds (Abe Peterson and Robert Alexie Sr. *in* GSCI and GRRB 2014) and noted that when caribou are not present, neither are the caches. Caches may be created by bears in the fall only to be returned to in the spring when the bears are hungry (GSCI and GRRB 2014).

The LKDFN (2015: 34) note that “[the grizzly] bear seems to eat anything now”, which is different from the past:

“I notice there is a change in what the grizzly bear eats. Now he eats anything – garbage, human waste” (Jonas Catholique *in* LKDFN 2001: 50).

This is seen as indicative of changes in the ecosystem⁴³, particularly within the last fifty years (LKDFN 2001). Further discussion of this is included in *Grizzly bear – human interactions*, p. 55.

Interactions

Grizzly bear – grizzly bear interactions

Grizzly bears are generally solitary, with the exception of family units of mothers and their cubs (unnamed Aklavik hunter *in* GSCI and GRRB 2014) and perhaps siblings (LKDFN 2015). More

⁴² A grizzly bear “was observed lying down and stalking three caribou. The bear was barely visible it was crouching so low. The three caribou were wounded and healing...[but they] spotted the bear and quickly ran away” (William Francis *in* GSCI and GRRB 2014: 36).

⁴³ The Denesuline do not speak of the ecosystem but of the Katthinene landscape. The Katthinene means ‘the area at the end of the (Great Slave) lake’, and refers to the area of Denesuline Nene (Chipewyan Land), which is described as being rich in resources (LKDFN 2001).

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details on the structure and function of the mother-cub(s) family unit can be found in *Life cycle and reproduction*, p. 42. Within these family groups, grizzly bear cubs are known to play with one another (unnamed Aklavik hunter *in* GSCI and GRRB 2014).

Adult male grizzly bears pose a threat to grizzly bear cubs^{44,45}, which explains the protective nature of mother grizzly bears (Lambert-Koizumi 2012; GSCI and GRRB 2014). The mother grizzly bear will work intentionally to keep her cubs from other grizzly bears, even foregoing more favourable habitat (more details can be found in *Habitat requirements*, p. 39). It has been noted that male grizzly bears have the ability to smell grizzly bear cubs from a distance (Abe Peterson *in* GSCI and GRRB 2014).

Adult grizzly bears are known to fight over food resources (GSCI and GRRB 2014) and during mating season male grizzly bears may fight. These fights may result in death, “although this is rare as one will usually run off” (Abe Wilson, Abe Peterson, and Eddie Greenland *in* GSCI and GRRB 2014: 46). Members of the LKDFN have never observed fighting among individual grizzly bears however (LKDFN 2015).

Grizzly bears are known to be cooperative if this can assist them in obtaining food or for general survival. For example, adult grizzly bears have been known to work together to hunt caribou, and have been seen sharing the kill afterward (Abe Peterson *in* GSCI and GRRB 2014)⁴⁶. Adult grizzly bears have also been known to share winter dens (GSCI and GRRB 2014). There are Gwich’in stories of up to four large bears in a single den (Mary Kendi and Robert Alexie Sr., GEKP 1996-97 *in* GSCI and GRRB 2014).

There are also examples of bears interacting peacefully with one another, generally around food sources that are very plentiful and where no threat would be posed (GSCI and GRRB 2014; Allaire pers. comm. 2016). An example of this would be the observation of an unnamed Aklavik hunter of a berry patch around Black Mountain with six bears eating from it (as relayed by Eddie Greenland *in* GSCI and GRRB 2014). In another example, Eddy McLeod (*in* GSCI and GRRB 2014: 36) talks about areas around water where fish are very plentiful:

⁴⁴ Johnnie Charlie (*in* Lambert-Koizumi 2012: 188) noted a case where he had seen “small bear paws in the scats of an adult grizzly bear.”

⁴⁵ Bullock (1987) noted that of the eight hunters interviewed for his questionnaire on grizzly bear traditional knowledge in the Richardson Mountains, none had seen or heard of attacks by a male grizzly bear on a female with cubs – Bullock even pointed out that visual sightings of “complete family groups, includ[ing] the adult male, occur” (Bullock 1987: 3). However, observations of male grizzly bears posing a threat to females and their cubs have been documented at a later date in the same region by “many interviewees” in a different source (GSCI and GRRB 2014: 47).

⁴⁶ Abe Peterson (*in* GSCI and GRRB 2014: 37) notes that such behaviour has been observed along the Dempster Highway near the NWT-Yukon border. Two bears cornered a large bull caribou: one bear “sort of grab him around the neck like and just hung right on... Didn’t take him very long knock him down and its dead.” The muscles in the caribou’s neck had been chewed, paralyzing it.

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“I don’t think they mind being around other bears, because you see them when they fish and...they just kind of ignore each other. But the big ones usually chase the smaller ones away.”

Grizzly bear – other bear interactions

In the Richardson Mountains, black bears live low on the slopes (RWED 2003; Eddie Greenland *in* GSCI and GRRB 2014) while the mountains are considered to be grizzly bear territory by the Gwich’in (Walter Alexie *in* GSCI and GRRB 2014). It is said that a grizzly bear will kill or chase away an encroaching black bear (Walter Alexie *in* GSCI and GRRB 2014).

Despite this, grizzly and black bears sometimes inhabit the same territory. This is seen in the Mackenzie Delta where “grizzly and black bear tracks have been spotted in the same area” (William Modeste *in* GSCI and GRRB 2014: 47): around Tsiigehtchic, north and east of the Mackenzie River/Delta, and along the Arctic Red River (John Norbert *in* GSCI and GRRB 2014). It is thought that when there is an increase in grizzly bears in an area, there will be a corresponding decrease in black bears⁴⁷ (George Niditchie and Noel Andre *in* GSCI and GRRB 2014). An Inuvialuit knowledge holder commented that “while the black bear population was increasing in the Delta, there were more grizzlies on Richards Island” (INU115 *in* ICC *et al.* 2006: 11-39). It is said that in the GSA, “black bears are more of a problem in the Delta⁴⁸, and grizzly bears a problem in the mountains⁴⁹” (GSCI and GRRB 2014: 41). In the Akaitcho region, members of the LKDFN have observed grizzly bears and black bears together, although the causes and implications of this interaction are unknown (LKDFN 2015).

The Gwich’in make note of an ‘intermediate bear’ found within the GSA; a black bear/grizzly bear hybrid (GSCI and GRRB 2014). This bear is larger than a black bear and is called shoh tsik (bear-brown) in Gwich’in. Grizzly bears and polar bears also interact in the northern part of the grizzly bears’ range, and this sometimes results in hybridization^{50,51} (Species at Risk Committee

⁴⁷ In the area between Fort McPherson and around Tsiigehtchic an increase in grizzly bears has resulted in a decrease in the black bear population (George Niditchie and Noel Andre *in* GSCI and GRRB 2014): “Long time ago, we use to, every little trip you make, you see a black bear. Now [there’s] nothing” (Noel Andre *in* GSCI and GRRB 2014: 47).

⁴⁸ “Grizzlies are not often actually spotted in the Delta and around camps” (GSCI and GRRB 2014: 42).

⁴⁹ “As the number of problem grizzly bears increase, there is a corresponding decrease in problem black bears” (George Niditchie *in* GSCI and GRRB 2014: 43).

⁵⁰ PIN 142, Paulatuk (*in* Joint Secretariat 2015: 92) notes: “In April we see grizzlies following the polar bears[,] so they’re interbreeding...Whenever they come out of their dens they’re walking the ice, then we used to see them; they [grizzlies] run into polar bear tracks, and they follow it.” In March 1996, the same knowledge holder witnessed such a mating occurring on the ice: “...I was surprised when I saw them together laying, rolling around...then we find out when we saw those tracks it was a grizzly and a polar bear...they were rolling around on the ice probably just starting to mate...” (PIN 142, Paulatuk *in* Joint Secretariat 2015: 92).

⁵¹ PIN 117, Ulukhaktok (*in* Joint Secretariat 2015: 92-93) encountered a male hybrid grizzly-polar bear mating with a female polar bear: “I seen a half grizzly-half polar bear...He was mating with a female...Young polar-grizzly...the

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[SARC] 2012; Joint Secretariat 2015). “...Male grizzly bears are known to mate with female polar bears...producing the famous ‘grolar’ or ‘polar grizz’ hybrid bear” (Joint Secretariat 2015: 92) (see *Habitat – Distribution trends*, p. 65 for more information).

Aside from mating, grizzly bears and polar bears are known to tolerate one another when feeding from the same carcass and when food is plentiful⁵² (Joint Secretariat 2015). Perhaps more frequently however, grizzly bears and polar bears fight and can kill each other (J. Haluksit *in* Slavik *et al.* 2009; Joint Secretariat 2015). Inuvialuit knowledge holders note that grizzly bears are more “aggressive” and “agile” than polar bears, which are seen as “laid back” in comparison⁵³ (PIN 158 *in* Joint Secretariat 2015: 52). In encounters between the two, Inuvialuit knowledge holders believe that grizzly bears “invariably dominate”^{54,55} (Joint Secretariat 2015: 91; Nirlungayuk 2011). It was reported in the early 2000s that a grizzly bear killed and consumed part of a polar bear (Lloyd Nerysoo, DSGBW 2006-11 *in* GSCI and GRRB 2014). Conversely, polar bears are known to hunt, scavenge, and eat grizzly bears (J. Pokiak *in* Slavik *et al.* 2009).

Grizzly bear as predator

See *Diet and feeding behaviour*, p. 46, for information on grizzly bears as predators.

Grizzly bear – wolf interactions

As competitors for some of the same animal food sources, grizzly bears and wolves have a complex relationship. In the GSA, both species are predators of the Porcupine caribou herd. Both species will scavenge from the kills of the other, and foxes and wolverines will scavenge from the kills of both species (Eddie Greenland and Ernest Vittrekwa *in* GSCI and GRRB 2014). While both species can and do “hunt in the same area without issue” (Abe Peterson *in* GSCI and GRRB 2014: 48), they may occasionally fight (Billy Wilson, DSGBW 2006-11 *in* GSCI and GRRB 2014). Such fights usually result in the grizzly bear winning (Billy Wilson, DSGBW

way it looks[:] it had a big hump on the back and big ears and his eyes were different. And also his claws. And also, he was not really white. But he was a big one.”

⁵² PIN 158, Paulatuk (*in* Joint Secretariat 2015: 92) noted grizzly and polar bears feeding from the same carcasses: “We have beached bowhead whales that die from natural causes. They come up to the beach and you see grizzlies and polar bears eating on them in the summertime...They are big animals and you have grizzlies and polar bears eating together. There is no conflict. There is so much food that they’re just eating, eating, eating.”

⁵³ PIN 158, Paulatuk (*in* Joint Secretariat 2015: 134) notes that: “Their behaviour, their attitude, is different. A grizzly is more mean-tempered and easy to get pissed off, and once he gets pissed off, he is like that. A polar bear is not as aggressive. He is more kind of laid back and just accepts things as is.”

⁵⁴ In 1994, PIN 123, Ulukhaktok (*in* Joint Secretariat 2015: 91) “found the remains of a polar bear that had just been killed by a grizzly...its back legs had been torn off.”

⁵⁵ PIN 121, Ulukhaktok (*in* Joint Secretariat 2015: 227) noted: “I see some polar bears killed by grizzly bear over here...Wynniatt Bay. Even little ones, mother and cubs, they were killed by a grizzly around there.”

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2006-11 *in* GSCI and GRRB 2014), which might mean death or injury for the wolf (Lloyd Nerysoo, DSGBW 2006-11 *in* GSCI and GRRB 2014)⁵⁶.

Two or more wolves do have the ability to take on and potentially kill a grizzly bear though (Walter Alexie *in* GSCI and GRRB 2014). As few as two wolves⁵⁷ (William Teya, GEKP 1996-97, George Niditchie and Woody Elias *all in* GSCI and GRRB 2014) and as many as a pack (Abe Peterson, DSGBW 2006-11 *in* GSCI and GRRB 2014; LKDFN 2015), have been known to attack, chase off, and potentially kill a grizzly bear. Wolves have been known to hunt grizzly bears as a food source (Peter Francis, DSGBW 2006-11 *in* GSCI and GRRB 2014).

Interactions with other animals

While all animals are said to be frightened of grizzly bears (GSCI and GRRB 2014), there have been observations of animals other than wolves attacking grizzly bears. There is an old Gwich'in story in which a porcupine killed a grizzly bear with its quills⁵⁸ (Robert Alexie Sr. *in* GSCI and GRRB 2014) and an observation from an unnamed Aklavik hunter (*in* GSCI and GRRB 2014) suggesting that wolverine may prey on grizzly bear cubs. Wolverine are also thought to be competitors of grizzly bears, especially for Dolly Varden char (Eddie Greenland and Freddy Furlong *in* GSCI and GRRB 2014). As noted in *Spiritual/cultural importance – The Inuvialuit*, p. 25, wolverine and grizzly bears are thought to be spiritual counterparts to one another (ICC *et al.* 2006). Although known to hunt muskox on occasion, these animals may prove to be difficult prey for grizzly bears, with muskoxen bulls able to cause fatal injuries with their horns (Nirlungayuk 2011).

Grizzly bear – human interactions

Grizzly bear – human interactions can have both positive and negative⁵⁹ effects on grizzly bear well-being and survival. Changing human technology and infrastructure have influenced the way and frequency that grizzly bears encounter humans on the land. Today, as compared to before the mass availability of skidoos, more people have access to all-terrain vehicles, and there is more

⁵⁶ “I have seen one wolf one time running from a grizzly bear. A grizzly bear was chasing it. And the wolf was limping. I think they were fighting over a caribou, because the grizzly bear was carrying a caribou in his mouth, one whole one, and the wolf was running away from it” (Lloyd Nerysoo, DSGBW 2006-11 *in* GSCI and GRRB 2014: 48).

⁵⁷ Woody Elias’ (*in* GSCI and GRRB 2014) father saw two wolves working together to kill a grizzly bear: one wolf hid and the other wolf herded the bear toward the hidden wolf. The hidden wolf attacked the bear by grabbing its snout, suffocating it, while the herding wolf attacked from the rear.

⁵⁸ “...[the grizzly bear] went and met this old porcupine. I don’t know, he just gave him a big slap and [the grizzly didn’t] know what happened, [so] the other side he gave him big slap too, [and the bear] bit it. And that’s the end of it there. Quills...killed the grizzly bear” (Robert Alexie Sr. *in* GSCI and GRRB 2014: 48).

⁵⁹ Even scientific studies have the potential to adversely affect grizzly bears. There have been reports of “...A grizzly bear shot east of Tsiigehtchic one year...[with] a festering wound from an ear tag. The...[bear]...had been tagged around Tuktoyaktuk, [and] the wound had made the bear ‘crazy’” (Nap Norbert, GEKP 1996-97 *in* GSCI and GRRB 2014).

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man-made infrastructure on the land (i.e., roads, trails, cabins). Such technology has facilitated access to the land, increasing the potential for grizzly bear-human interactions. Some elements of human infrastructure have proven useful to grizzly bears, such as man-made trails and seismic lines, which grizzly bears can use to move from place to place (GSCI and GRRB 2014).

Other human structures, such as waste dumps, may also attract grizzly bears; however, as noted by Berger (1977: 100) “ineffective waste management practices” that attract bears to areas inhabited by people may ultimately result in bears needing to be destroyed to maintain human safety. In Aklavik, three grizzly bears (a mother and two cubs) are regularly spotted⁶⁰ at the dump (GSCI and GRRB 2014). This is considered to be a recent occurrence (Freddie Greenland, DSGBW 2006-11 *in* GSCI and GRRB 2014) and has been happening for a number of years (GSCI and GRRB 2014). This may be because the dump is not burning as much garbage as in the past, or people may be throwing away more food than in the past (Eddy McLeod *in* GSCI and GRRB 2014). Grizzly bears have also been spotted in the Inuvik dump and its immediate vicinity (including pedestrian trails located near the dump (John Norbert *in* GSCI and GRRB 2014). Community members in Kugluktuk and Baker Lake, Nunavut, have also noticed that grizzly bears, in addition to being present in higher numbers, are becoming a nuisance; coming into town and disturbing peoples’ cabins and caribou caches (Nirlungayuk 2011).

Human camps can also provide sources of food for grizzly bears, with grizzly bear encounters tending to take place in the spring⁶¹, when grizzly bears are coming out of hibernation (John Norbert and William Modeste *in* GSCI and GRRB 2014). Grizzly bears are curious and may approach occupied camp buildings (William Modeste *in* GSCI and GRRB 2014) and may also hang around outside of camp waiting for the camp to empty before approaching (Woody Elias *in* GSCI and GRRB 2014). Either of these habits, and the possibility of food being left in camps, may habituate bears to camps and increase the potential for encounters with humans. It is thought that most bear encounters happen in camps, with a smaller number of encounters taking place while people are out hunting⁶² (RWED 2003; GSCI and GRRB 2014). Hunters in the Mackenzie Mountains have repeatedly commented on problems created by grizzly bears around camps (Larter and Allaire 2015).

In the present, as in the past, people seek out some of the same resources that grizzly bears do. This includes food resources (i.e., berries, fish, caribou) and the same borrow sources (i.e., gravel eskers that provide material for roads) that grizzly bears find to be ideal den locations (Berger 1977). When humans are out on the land hunting, it is feasible that grizzly bears are out engaged in the same activity. There have been multiple reports of grizzly bears being attracted to gun

⁶⁰ Black bears used to be spotted at the dump as well (unnamed Aklavik hunter *in* GSCI and GRRB 2014).

⁶¹ George Niditchie (*in* GSCI and GRRB 2014: 43) notes that in the Kugaluk area bears are seen in the spring and fall – in the summer “they’re all over the country.”

⁶² RWED (2003: 8) has data that supports this: in the ISR, between 1960-2000, 322 bear problems were reported in camps while 63 bear problems were reported on the land. The problem bears reported were both grizzly and black bears.

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shots (Bolstad pers. comm. 2016). Hunters and those spending time on the land in the Mackenzie Mountains and along the Dempster Highway have observed, over the course of the last decade, that grizzly bears have gone from being deterred by the sound of gunshots to being attracted to them (Larter pers. comm. 2015; Allaire pers. comm. 2016⁶³). Gwich'in Elders say that grizzly bears can hear gunshots from 20 miles away (Abe Wilson *in* GSCI and GRRB 2014), and may approach and even sneak up on a hunter working at skinning and butchering a kill. They may have learned that people will be distracted after a successful kill (Billy Wilson, DSGBW 2006-11 *in* GSCI and GRRB 2014). Grizzly bears will take kills when possible^{64,65,66}. In fact, Larter and Allaire (2015) describe two recent incidents in the Mackenzie Mountains where grizzly bears took meat or hides while people were still in the vicinity. Eddy McLeod (*in* GSCI and GRRB 2014: 39) notes that Gwich'in Elders maintain that it is the “older bears [that] are the most likely to approach hunters”, pointing to habituation and learned behaviour. It is said that “once a grizzly bear approaches...[a] carcass, it will always come back for it” (Robert Alexie Sr. *in* GSCI and GRRB 2014: 40). George Niditchie (*in* GSCI and GRRB 2014: 40) believes that “the problem of grizzlies approaching hunters may be a more recent phenomena”. This may be because there are more bears, and they are less afraid of people (George Niditchie *in* GSCI and GRRB 2014).

Some knowledge holders believe that human-grizzly bear interactions are less likely to occur than in the past (Bullock 1987; Ernest Vittrekwa, DSGBW 2006-11 *in* GSCI and GRRB 2014), perhaps because grizzly bears are frightened by ‘modern’ noises and technology, such as the use of skidoos while hunting. In the past, hunters would not have had access to fast methods of transportation and would have needed to camp out on the land and travel by dog team⁶⁷. It is

⁶³ Allaire (pers. comm. 2016) notes: “Grizzlies in the Mackenzie Mountains are getting used to non-resident hunters hunting with outfitters. They are attracted to gunshots. The bears know where the permanent outfitter camps are, they come during the night and steal meat, capes every year. There are grizzly bear comments made by hunters every year. Many hunters had close calls with bears. Meat and capes have been taken by bears. They feel that the bears have lost their fear of humans since they haven’t been hunted since 1982. A lot of outfitters use electric fences to deter bears. They avoid hunting in areas where there are lots of bears. They move around temporary hunting camps so the bears do not get familiar with them. My uncle has hunted barren-ground caribou on the Dempster before. He was warned by local hunters to skin any caribou he shot quickly and leave the area. Grizzlies in the area are attracted by gunshots; they have been habituated by hunters hunting along the highway for generations.”

⁶⁴ Ernest Vittrekwa (*in* GSCI and GRRB 2014) tells of shooting two caribou bulls near the Dempster Highway, and then going to get his skidoo. When he returned he saw two grizzly bears walking away with a caribou each.

⁶⁵ Johnnie Charlie (*in* Lambert-Koizumi 2012: 189) recalled: “I know that when we go hunting in the fall, sometimes we don’t take the caribou out because there are grizzly bears. I see grizzly bears sitting on caribou...If I shoot caribou, they are there the next day, eating the guts and all. You got to get your meat and get out of there.”

⁶⁶ “...usually, if there are lots of caribou in the winter and there are lots of guts around, there’re lots of bears around.” (Ian McLeod, DSGBW 2006-11 *in* GSCI and GRRB 2014: 37)

⁶⁷ Bullock (1987: 4, 6-7) noted that: “Before the vast influx of trade goods, when people relied on dog teams as a means of transportation and protection, camp bear attacks were more frequent. This may be attributed to more food cached in camp for consumption and winter feed,” and “Aklavik hunters having camps on Herschel Island and Firth River, Yukon region, are bewildered as to why in the past bear problems were non-existent, but now they are more bothersome. Hunters based in the Mackenzie Delta observed that frequency of grizzly bear sightings were greater

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thought that given this apparent defenselessness, grizzly bears would have been “more likely to approach a camp, and scavenge guts or try to steal meat” (Eddie Greenland *in* GSCI and GRRB 2014: 40). Elaborate ‘bear-proof’ man-made food caches have been excavated in the Richardson Mountains, demonstrating that grizzly bears did present a problem to people in the distant past who hunted and stored their meat in this fashion (GSCI and GRRB 2014).

The opposing viewpoint holds that encounters with grizzly bears have increased as compared to the past⁶⁸. It is thought that 15-20 years ago the frequency of human-grizzly bear interactions began to increase (GSCI and GRRB 2014). Now it is observed that any amount of food left at camp or in vehicles may result in damage by grizzly bears trying to access food (GSCI and GRRB 2014). Grizzly bears are generally scared of people; however, they can be curious (GSCI and GRRB 2014), and their fear may also cause them to attack (unnamed Aklavik hunter *in* GSCI and GRRB 2014). Some Inuvialuit hunters have noted that grizzly bears “are not scared any more of humans... bears are hungry and the roots they feed on are drying up because the land is drying up” (AK225 *in* ICC *et al.* 2006: 11-39), and “brown bears are starting to get dangerous, so many of them around” (T113 *in* ICC *et al.* 2006: 11-39). Likewise, Mackenzie Mountain hunters feel that grizzly bears have lost their fear of humans as the grizzly bear harvest has decreased, resulting in a human safety issue, including one human fatality in 2014 as a result of a grizzly bear attack (Larter and Allaire 2015; Allaire pers. comm. 2016).

The LKDFN (2001) also note⁶⁹ that grizzly bears do “not seem to [be] afraid of people anymore” (LKDFN 2001: 34) although members could not recall any instances of individuals being killed by grizzly bears (LKDFN 2015). This new behaviour, seen in grizzly bears and other wildlife species, is attributed to “changes in the Denesuline land use and development activities in the region” (LKDFN 2001: 50). It is thought that grizzly bears can become habituated to unusual activity and people if exposed to them frequently, becoming ‘less wild’:

“They’re not wild like they used to be...too much people now, helicopter, plane, trucks, skidoos, four wheelers, anything” (Walter Alexie *in* GSCI and GRRB 2014: 35).

There has been an increase in human-grizzly bear interactions in the ISR (Clark 1996; Clark and Slocombe 2011) and some Gwich’in of the Mackenzie Delta believe that incidents have increased compared to the past⁷⁰. Inuvialuit Game Council reports from 1997-2003 show bears

before the arrival of skidoos and float planes.” This suggests that the frequency of bear problems in the past (and now in the future) may have been different regionally.

⁶⁸ PIN 44, Tuktoyaktuk (*in* Joint Secretariat 2015: 189) noted, when asked about problem bears in Tuktoyaktuk, “...not polar bears, but definitely nowadays starting to be grizzly bear problems.”

⁶⁹ “...In [the] past – bears never used to come around and bother people. Now they come into camp and bother people – it’s dangerous. They don’t seem to be scared of people anymore. In the past all the wild animals used to be afraid of us.” (Jonas Catholique *in* LKDFN 2001: 50).

⁷⁰ “Long ago, when I was growing up, nobody had a problem with bears. You know, people leaving everything in their camps, cabins, and you go back there in a couple months’ time, it’s still the same” (unnamed Aklavik hunter *in* GSCI and GRRB 2014: 40).

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(both grizzly and black bears) breaking into camps in the ISR every year apart from one, with incidents usually recorded in late summer (Clark 1996; Clark and Slocombe 2011). It is felt that the number of camps in the ISR is increasing, and that the people using camps now are only ‘weekend’ users (Clark 1996; Clark and Slocombe 2011). They may not be as diligent as more regular land users in cleaning and emptying their camps, and they are not regularly present to keep bears away, potentially contributing to the problem (Clark 1996; Clark and Slocombe 2011).

It has been noted that in the past people would stay out on the land in camps more often. This may have meant that a constant human presence acted as a deterrent⁷¹ (Abe Peterson and George Niditchie *in* GSCI and GRRB 2014) and also that “problem bears were more likely to be controlled as people would be at camps if they approached and would kill them to protect the camp, and take the skin” (unnamed Aklavik hunter and Eddy McLeod *in* GSCI and GRRB 2014: 41). With many empty camps out on the land, grizzly bears may have learned “to break into camps just to check [if there is food], even if the camp is very clean” (Freddie Greenland, DSGBW 2006-11 *in* GSCI and GRRB 2014: 41).

Clark and Slocombe (2011), attempting to shed light on why bear-human conflicts appear to be on the increase, named ‘ecological changes’ as a potential driver. Examples of such ecological changes include increases in the number of bears, reduction in available food, and an increase in human access to grizzly bear habitat (along with associated attractants such as hunter kills and garbage) (Clark and Slocombe 2011). They point out that grizzly bears will adapt to changes and exploit those that are advantageous (i.e., increased garbage on the land), just as they have always done (Clark and Slocombe 2011). Unfortunately, as noted by Berger (1977: 100), “interactions between men and bears are usually viewed as threats to human safety, and bears are therefore usually eliminated from areas in which there is human activity.”

⁷¹ George Niditchie (*in* GSCI and GRRB 2014: 42) notes that grizzly bears do not usually approach camps that are inhabited. “Well, if you’re there, he don’t bother it.”

STATE AND TRENDS

Population

Abundance

An estimate of grizzly bear abundance was not included in the sources examined. In general, Berger (1977: 99) noted that barren-ground grizzly bears were not overly abundant compared to the Yukon (and thus presumably mountain-dwelling) population, while hunters and outfitters in the Mackenzie Mountains regularly comment on the high abundance of grizzly bears in this region (Larter and Allaire 2015).

Knowledge holders note that different factors can influence abundance observations of grizzly bears. For example, as there are fewer Porcupine caribou in the GSA, people are travelling less into the Richardson Mountains. As a consequence, they may be seeing fewer grizzly bears (although it is thought that there are more grizzly bears in the Richardson Mountains now than in the past) (Eddy McLeod *in* GSCI and GRRB 2014). In another example, George Niditchie (*in* GSCI and GRRB 2014) notes that grizzly bears are not often seen up the Arctic Red River⁷², as the bears may be following the Dempster Highway and are thus more frequently seen between Fort McPherson and Tsiigehtchic⁷³. This is not consistent with historical observations (interviews conducted in 1996-97), when grizzly bear sightings in the Tsiigehtchic area were rare (Gabe Andre, GEKP 1996-97 *in* GSCI and GRRB 2014). In general, Gwich'in knowledge holders note that grizzly bear sightings were rare before the Dempster Highway was built. At that time, people would travel mainly by boat along the Peel River to get to their camps. "Since the highway was built, more grizzlies are seen as people are more often going into grizzly country in the mountains" (Robert Alexie Sr. *in* GSCI and GRRB 2014: 38).

Gwich'in Knowledge of Grizzly Bears (GSCI and GRRB 2014) notes that trying to compare grizzly bear populations between different time periods, particularly long ago, is difficult because of differences in how/when people access the land, which influences how/when grizzly bears are seen. For example, "people can now travel very quickly using skidoos and outboard motors, and see a lot more of the country very quickly" compared to the past (William Modeste *in* GSCI and GRRB 2014: 54).

⁷² "You don't see them on that way...They're close to the highway, that's where you see them." (George Niditchie *in* GSCI and GRRB 2014: 52).

⁷³ "It is likely that there were always grizzly bears in the area[,] at least to some degree...and the highway is allowing the bears to be seen more often." (Fort McPherson verification session *in* GSCI and GRRB 2014-: 52).

Trends and fluctuations

Inuvialuit Settlement Region

Grizzly bears appear to be common in the Mackenzie Delta, which is reflected in the frequent incidents of camps being broken into by bears (INU152 in ICC *et al.* 2006). A hunter from Inuvik cautioned that in more recent times “there are many grizzlies, especially during spring” (INU146 in ICC *et al.* 2006: 11-42). Additionally however, there are certainly more grizzly bears observed in other areas of mainland ISR and on Banks and Victoria islands (Slavik *et al.* 2009; Gau pers. comm. 2016; WMAC (NWT) pers. comm. 2016). Some Inuvialuit attribute this range expansion to an increasing population throughout the ISR (WMAC (NWT) pers. comm. 2016; unnamed Aklavik hunter, Abe Wilson, and Ernest Vittekwa in GSCI and GRRB 2014: 49).

Gwich'in Settlement Area

Gwich'in traditional knowledge holders make note of at least three population decreases in the past, as shown in Table 3 (below), and a more recent period of population stability and potential increase (Lambert-Koizumi 2012; GSCI and GRRB 2014). Land users in the communities of Inuvik, Fort McPherson, and Tsiigehtchic have reported that the grizzly bear population near these communities has remained steady or increased over the last five years (Arctic Borderlands Ecological Knowledge Cooperative [ABEKC] 2015). It is believed that the grizzly bear population in this area may continue to increase over the next decade if hunting pressure continues to remain low (Abe Peterson and George Niditchie in GSCI and GRRB 2014).

Table 3. Trends in GSA grizzly bear population since the 1940s.

Time period	Trend observed	Potential reason(s) for trend as cited by knowledge holders	Sources
Pre-1940s ⁷⁴	“There were many [grizzly bears]” (Gwich'in Elders 1997: 66)	Reduced hunting pressure as grizzly bears were seldom hunted and human access was limited	Gwich'in Elders 1997; Lambert-Koizumi 2012
1940s ⁷⁵ , 1950s, 1960s	Population decline in the Richardson Mountains	Scarcity of food resources (i.e., moose and caribou)	Freddie Greenland, Abe Peterson, and Peter Francis, DSGBW 2006-11 and Abe Peterson <i>all in</i> GSCI and GRRB 2014

⁷⁴ Lambert-Koizumi (2012: 186) cited a report on grizzly bear abundance going back to 1927, which noted that “grizzly bears were remembered as being numerous and could be found nearly everywhere”.

⁷⁵ Peter Francis (*in* Lambert-Koizumi 2012: 186) remembered: “You know in 1947, people used to make dry rats for dogs during the summer...they hanged them up in their fish house...around Rat River, or any place in the whole Delta...they dried them and they hanged them the whole summer there, because there were no black bears or no grizzly bears.”

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Time period	Trend observed	Potential reason(s) for trend as cited by knowledge holders	Sources
1960s or so ⁷⁶	Population decline	Skidoos become common, allowing increased access	Eddie Greenland, DSGBW 2006-11 <i>in</i> GSCI and GRRB 2014
1970s to early 1980s	Grizzly bears rare in the Richardson Mountains	Overhunting, increased access	Lambert-Koizumi 2012
1980s, 1990s ⁷⁷ , possibly as late as the early 2000s	Population decline ⁷⁸	Hunting pressure ⁷⁹ and/or opening of the Dempster Highway	Lloyd Nerysoo and Glen Alexie, DSGBW 2006-11 <i>in</i> GSCI and GRRB 2014
2006	Population ‘good’ or increasing	Porcupine caribou herd further away from Fort McPherson, may have caused a “noticeable lack of [observed] grizzly bears” (Peter James Kay, DSGBW 2006-11 <i>in</i> GSCI and GRRB 2014: 53). It is thought that bears shifted hunting pressure to moose in the Delta at this time. The establishment of a harvest tag system to promote population recovery.	Peter James Kay, DSGBW 2006-11 <i>in</i> GSCI and GRRB 2014; Lambert-Koizumi 2012
2012	Population increasing or high ⁸⁰	Porcupine caribou herd close to communities	GSCI and GRRB 2014
2014	Population stable or increasing. Maybe “too many” ⁸¹ (Abe Peterson, Ernest Vittrekwa, and John Norbert <i>in</i> GSCI and GRRB 2014: 54).	Bears following/hunting the caribou herds are on the increase. Tag system may have reduced hunting pressure.	Abe Peterson, Ernest Vittrekwa, and John Norbert <i>in</i> GSCI and GRRB 2014

⁷⁶ Eddie Greenland, DSGBW 2006-11 (*in* GSCI and GRRB 2014: 53) notes that “...before skidoos came in...there were quite a bit of bears.”

⁷⁷ John Carmichael (DSGBW 2006-11 *in* GSCI and GRRB 2014: 53) felt that in the mid-90s the population of grizzly bears “around Summit Lake near the headwaters of the Rat River was up...[and that] perhaps the grizzlies had moved from the front ranges back further in the mountains.”

⁷⁸ This resulted in a voluntary moratorium on hunting in the GSA from 1992-1998 (GRRB 2009), which was followed by the implementation of the tag system (Lambert-Koizumi 2012).

⁷⁹ Without the tag system and a high price for skins, it was said that “one winter in Aklavik...hunters harvested many grizzlies” (Freddie Greenland, DSGBW 2006-11 *in* GSCI and GRRB 2014: 53). As a result, the population dropped and a management system was implemented, including the tag system now in place (Eddie Greenland and William Modeste *in* GSCI and GRRB 2014).

⁸⁰ Freddy Furlong (*in* GSCI and GRRB 2014: 53) felt that the population of grizzly bears was declining. This was different from “many interviewees in 2012 [who] felt that the population of grizzly bears was increasing or high.”

⁸¹ The area on the Dempster Highway around the Yukon-NWT border was cited as one with a particularly ‘worrisome’ increase in population (GSCI and GRRB 2014).

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In the area of the Mackenzie Delta and around Tsiigehtchic, the grizzly bear population appears to have been increasing in recent years (GSCI and GRRB 2014). It is said that grizzly bears used to be “scarcer in the Delta than they are now” (Eddy McLeod and John Norbert *in* GSCI and GRRB 2014). With fewer people on the land it is thought that fewer bears are being killed in defence of life and property, and thus the grizzly bear population may be increasing (Eddy McLeod and John Norbert *in* GSCI and GRRB 2014). Despite this, it is noted that the population of grizzly bears in the Delta is still considered to be fewer than in the Richardson Mountains (Johnny Charlie, DSGBW 2006-11 *in* GSCI and GRRB 2014) (see *Habitat Requirements*, p. 39 for more information).

Mackenzie Mountains

Outfitters in the Mackenzie Mountains indicate that there is a healthy grizzly bear population in the mountains, which has increased in the last twenty years (Association of Mackenzie Mountain Outfitters [AMMO] pers. comm. 2015). Indeed, outfitters and guided hunters through annual surveys have reported more grizzly bears seen in the Mackenzie Mountains since annual observation surveys were initiated in 1996 (Larter and Allaire 2015).

Nunavut

In Nunavut, Nirlungayuak (2011) reported that knowledge holders in Baker Lake indicated that there were almost no encounters with grizzly bears 40-50 years ago. Knowledge holders in Kugluktuk on the other hand, indicated that encounters with grizzly bears in their area were comparatively common, with hunters well-versed in hunting these animals. Overall, knowledge holders in these two communities indicated that the grizzly bear population was healthy and expanding, with numbers increasing over the last 50 years (Nirlungayuk 2011).

Population dynamics

It is thought that grizzly bears do not have population cycles as rabbit and lynx do. This idea has been tied to the observation that “ground squirrels, an important source of food for...[grizzly] bears, do not seem to cycle either” (Eddy McLeod *in* GSCI and GRRB 2014). Other observations have tied declines in the population of grizzly bears in the mountains around Fort McPherson to years “when the caribou herd does not migrate nearby” (Abe Peterson *in* GSCI and GRRB 2014: 54).

Other

Hunting pressure for larger ‘trophy-sized’ grizzly bears may mean that the bears that are now observed are physically smaller in size (Lambert-Koizumi 2012). For example, grizzly bears are

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seen around Aklavik, but hunting pressure may mean that there are fewer large male grizzly bears⁸² and more (smaller) young bears (Ryan McLeod, DSGBW 2006-11 *in* GSCI and GRRB 2014). However, it is important to note that non-resident and non-resident alien hunting of grizzly bears was closed in 1982 in the Mackenzie Mountains (Larter and Allaire 2015).

Habitat

Habitat availability

The Gwich'in note that there are no special areas⁸³ that require protection in order to ensure the survival of grizzly bear as a species; however, protection zones that are created should be large (i.e., the Richardson Mountains), or contain areas that hold plentiful food resources (GSCI and GRRB 2014). An example would be lakes and rivers that contain fish species utilized by grizzly bears (John Norbert *in* GSCI and GRRB 2014).

Inuvialuit don't believe that habitat is limited for grizzly bears in the ISR but have noted several areas of importance, including Toker Point and coastal areas, starting at the western portion of Richards Island, east to Fingers Area, northeast to include Tuktoyaktuk Peninsula for denning. A second critical denning habitat area is from the mouth of Anderson River along the coast of Wood Bay, to include the mouth of the Horton River, south along the Horton River, southeast to include the main section of the Anderson River (Community of Tuktoyaktuk *et al.* 2008).

Habitat fragmentation and trends

The sources examined do not speak about the fragmentation of grizzly bear habitat within the NWT, nor about trends or changes in suitable grizzly bear habitat. Grizzly bears seem adept at moving between habitat types with ease. Knowledge holders have spoken about the temporary deterrent effect of human infrastructure and development (see *Grizzly bear – human interactions*, p. 55 for more details) and Nirlungayuk (2011) indicated that knowledge holders in Nunavut felt that grizzly bear distribution was increasing north and east because of habitat loss resulting from forest fires and industry in other areas. In contrast, Woody Elias (*in* GSCI and GRRB 2014) believes that warmer summer temperatures are to blame for the northward expansion of grizzly bear range.

⁸² Ian McLeod (DSGBW 2006-11 *in* GSCI and GRRB 2014: 52): “I don't know if there's less [grizzly bears around], but I know from work, they used to fill all the tags all the time. But now, even the Inuvialuit are returning tags. Usually, they fill theirs right away.”

⁸³ Bullock (1987: 3) noted that “there is no specific areas favored by bears”, and thus the take-away would be that all areas need to be protected, or that larger tracts of land, which capture as much variation as necessary, are best.

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Grizzly bear populations are affected when habitat quality declines, for example when the abundance of an important food type decreases. In such cases, grizzly bears will move to different habitat areas where more food is available (see *Movements*, p. 40 for more details).

Distribution trends

Grizzly bear distribution and range is increasing compared to the past, specifically on the arctic islands. The Gwich'in note that grizzly bears are moving into the ISR, potentially because of warmer summer temperatures (GSCI and GRRB 2014). As shown in Figure 4 (p. 66), grizzly bears “entering the polar bears’ range [have] been identified as [a] possible threat [to polar bears]” (SARC 2012). This observation is not new and observations of grizzly bears on Banks, Victoria (Slavik *et al.* 2009), and Melville islands (Taylor 1995; Pongracz pers. comm. 2016) are thought to be occurring more than in the past.

Banks Island

In 1949 or 1950, Fred Carpenter harvested a grizzly bear on Banks Island (Joint Secretariat 2015). In the late-2000s, a grizzly bear was observed on Banks Island (Slavik *et al.* 2009). In 2006, the first recorded polar-grizzly hybrid was shot and killed in southeast Banks Island. The ENR harvest report (ENR 2014b) for 2009-10 to 2013-14 shows subsistence harvest of grizzly bears in 2 locations on southern Banks Island. Sachs Harbour Elders note seeing more grizzly bears “now...[that] were not here in the past” (Sachs Harbour HTC 2013: 2). Grizzly bears “appear to be increasing in population and moving north, possibly crossing ocean ice and even interbreeding with polar bears” (unnamed Aklavik hunter, Abe Wilson, and Ernest Vittrekwa *in* GSCI and GRRB 2014: 49). A knowledge holder in Tuktoyaktuk noted that grizzly bears on Banks and Victoria islands are killing muskox and fighting with polar bears (PIN 38 *in* Joint Secretariat 2015).

Victoria Island

In the late-2000s a grizzly bear was observed on Victoria Island (Slavik *et al.* 2009). By 2010, two other hybrid grizzly bears had been killed on Victoria Island (one in Ulukhaktok), including what may be the first recorded second-generation polar-grizzly bear hybrid, the result of a female grizzly-polar hybrid mating with a male grizzly bear (Branigan pers. comm. 2016).

The ENR harvest report (ENR 2014b) for 2009-10 to 2013-14 shows subsistence harvest of grizzly bears, plus one problem bear, at 6 locations near Ulukhaktok and in Prince Albert Sound, plus one out on the sea ice south of Ulukhaktok. Knowledge holders in Ulukhaktok tend to blame grizzly bears (versus polar bears) when damage occurs to their cabins (Joint Secretariat 2015). Notably, it has also been reported that grizzly bears are even on northern Victoria Island, around Wynniatt Bay. A person in Ulukhaktok (PIN 121 *in* Joint Secretariat 2015: 227) noted: “I see some polar bears killed by grizzly bear over here...Wynniatt Bay. Even little ones, mother

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and cubs, they were killed by a grizzly around there.”

Melville Island

There is also evidence that grizzly bears could be extending their range as far north as Melville Island. In May 1991, a 320 kg adult male was captured 60 kilometres (km) south of Dundas Peninsula, Melville Island (Taylor 1995). There are also additional locations where ENR captured grizzly bears between 2012-2014 in the Viscount Melville Sound area (Jodie Pongracz pers. comm. 2016).

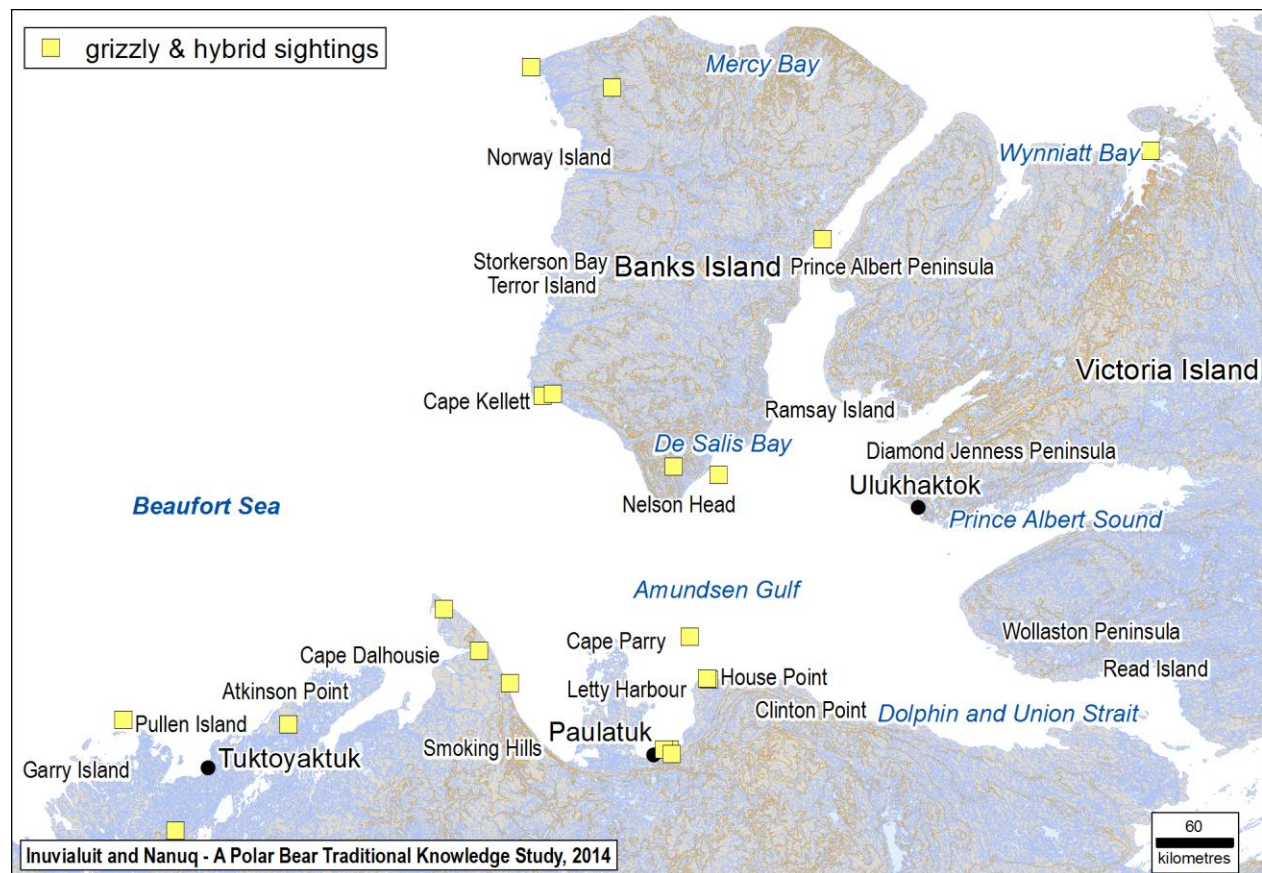


Figure 4. Places where Inuvialuit traditional knowledge holders harvested and/or observed grizzly and/or hybrid polar-grizzly bears or tracks. Reproduced from Joint Secretariat (2015) and used with permission.

Grizzly bear distribution can be affected by larger scale changes to important food resources (more details in *Movements*, p. 40) (GSCI and GRRB 2014). For example, if berries are more abundant in the mountains versus the Mackenzie Delta over a period of years, grizzly bears will shift their distribution (Eddy McLeod in GSCI and GRRB 2014). While the berries themselves are important to the diet of grizzly bears, caribou and ground squirrels also eat berries and are also important food sources (Woody Elias in GSCI and GRRB 2014).

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ICC *et al.* (2006: 11-38) note that “if caribou are plentiful, there will be many bears.” Some knowledge holders in the Tuktoyaktuk area have commented that the increase in the grizzly bear population seen at the time may have been due to the return of caribou to the area: “There are more brown bears because there are more caribou” (TO07 in ICC *et al.* 2006: 11-39). In much the same vein, Inuvialuit hunters have noted that Running River is observed to have many grizzly bears, “probably because there are lots of fish at the river” (INU126 in ICC *et al.* 2006: 11-39) (see *Threats and Limiting Factors – Natural events and changes to food supply*, p. 69, for more information).

In the 2012 Land Use Reports for the Avalon (NSMA 2012a) and NICO (NSMA 2012b) mines, the NSMA made note of grizzly bears being ‘invasive species’ in the respective areas of the two mines.

THREATS AND LIMITING FACTORS

Human-grizzly bear interactions

Shooting grizzly bears for the defense of life and property was identified as a threat to the grizzly bear population in the GSA. It is thought that grizzly bears are becoming bolder (Walter Alexie in GSCI and GRRB 2014), but also that people are less aware of how to interact with bears correctly (GSCI and GRRB 2014). The idea that grizzly bears are becoming bolder has also been expressed for bears in the Mackenzie Mountains (Larter and Allaire 2015). Clark and Slocombe (2009) note that in many first-hand accounts of bear-human conflicts there is mention of specific circumstances that may have contributed to the conflict, such as a potential food source (i.e., a hunter’s kill, an untidy camp), a bear that is in poor physical condition, or a situation in which a bear was surprised. More information on human-grizzly bear interactions can be found in *Grizzly bear – human interactions* (p. 55).

Development

Development functions as a threat to grizzly bear populations as it can cause the loss of both denning habitat and adequate food sources. For example, Berger (1977) pointed out that the same loose gravel esker sites that bears would use for denning are also the same areas that would serve as borrow sources (i.e., sources of gravel for construction of roads and other infrastructure).

The Inuvialuit have expressed concern about a potential pipeline running “right through the heart of the Inuvik Grizzly Bear Management Area” (ICC *et al.* 2006: 11-43; see *Inuvialuit Settlement Region Inuvik Hunters and Trappers Committee Regulations*, NWT Reg 033-93 for description of this management area). It is thought that the presence of a pipeline would affect grizzly bear harvesting by causing grizzly bears to move out of the area (ICC *et al.* 2006). ICC *et al.* (2006) has stated that no matter the cost of alternative construction, “bear dens should be avoided and/or skirted by...[a] pipeline” (ICC *et al.* 2006: 11-43).

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Development activity may spook either grizzly bears or potential prey with noise (LKDFN 2015), or it may function as a barrier. It has been noted that grizzly bears, “along with other animals such as moose and sheep, took decades to get used to the highway” (presumably referring to the Dempster Highway) (GSCI and GRRB 2014: 55). Observing these animals near the highway, or crossing it, is relatively recent even though the road to Fort McPherson has existed since the late 1970s (GSCI and GRRB 2014). Grizzly bears can become habituated to human settlements and roads, even busy ones like the Dempster Highway⁸⁴, thus they may not act as barriers/deterrents after some time has passed (unnamed Aklavik hunter and Abe Wilson in GSCI and GRRB 2014).

In ICC *et al.* (2006: 11-43), knowledge holders speak about development pressures on grizzly bears, including traffic and ice roads in particular: “Grizzly bears are known to be sensitive to traffic and are never seen close to ice roads.” Helicopter traffic, for example for scientific⁸⁵ and exploration purposes, was also thought to “negatively affect...bears and Inuvialuit hunters’ ability to hunt bears” (ICC *et al.* 2006: 11-43). INU100 (in ICC *et al.* 2006: 11-43) commented: “helicopters scare the bears out of their normal range.” PIN 12, Aklavik (in Joint Secretariat 2015: 286) noted that:

“I used to work with a biologist doing grizzly bear [collaring] and using chopper, and I don’t think that’s a good way because it’s so hot there. Usually it’s in the summer time or in the late spring, and it’s hard on the bear. They’ll just keep running...”

The Gwich’in make direct reference to development noise when they note that grizzly bears may become habituated to human presence and human noise after some time (GSCI and GRRB 2014), and that man-made noises may even attract bears (more details are included in *Grizzly bear – human interactions*, p. 55) (Eddy McLeod and George Niditchie in GSCI and GRRB 2014). However, loud noises such as a generator, and engine noises such as skidoos, helicopters, or airplanes, may spook bears and cause them to leave an area (Freddy Furlong in GSCI and GRRB 2014; LKDFN 2015).

In addition, construction and construction noise has the ability to threaten bears that are denning or cause harassment:

“Bears occupy their dens during winter...If a bear is disturbed and forced to abandon a den in winter, the lack of food, inability to dig a new den in the frozen soil, and the cold would certainly lead to the bear’s death. At other times of the year, extended harassment might deplete stored reserves of energy or cause death by physical exhaustion or overheating” (Berger 1977: 100).

⁸⁴ The report preparer once observed a young male grizzly bear walking down the center of the Dempster Highway near the NWT-Yukon border. The bear appeared to be completely nonplussed that he was holding up lines of traffic going in both directions.

⁸⁵ PIN 159, Paulatuk (in Joint Secretariat 2015: 286-287) noted that darting and netting grizzly bears (as well as other animals) stresses them and may be behind declines in numbers.

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Natural events and changes to food supply

Stochastic natural events such as forest fires and flooding are a threat to grizzly bears, both as a mortal danger and through loss of habitat and food resources⁸⁶ (GSCI and GRRB 2014). It is known that grizzly bears will leave an area if they spot forest fire smoke, especially mothers with cubs (Antoine Andre, GEKP 1996-97 in GSCI and GRRB 2014). Bears will return to the area eventually, but it may take some time:

“It take a few years, because there [will] be no ground squirrels, and no berries, and no roots. A lot of times they eat leaves too you know, just like moose” (Gabe Andre, GEKP 1996-97 in GSCI and GRRB 2014).

It is thought that flooding in the Mackenzie Delta may have reduced the grizzly bear population in the last several years, either through drowning, starvation (the flooding having affected the food supply), or through emigration to the mountains (Abe Peterson in GSCI and GRRB 2014).

Starvation, through the reduction of important food resources, is a threat to the grizzly bear population (Lloyd Nerysoo, DSGBW 2006-11 in GSCI and GRRB 2014). Factors that affect prey populations or vegetation abundance may therefore have an impact on grizzly bears. As noted in *Diet and Feeding Behaviour* (p. 46), grizzly bears consume a wide variety of foods, with caribou, berries, and muskrat being some of the most important food sources.

Generally declining trends in barren-ground caribou have been documented throughout North America; the Porcupine herd appears to be the only exception (Adamczewski *et al* 2015; Campbell 2015). Further, the GRRB has noted declines in berries over the past three years, a steep decline in the muskrat population, low numbers of Dall sheep in the Richardson Mountains (<500 animals) (GRRB pers. comm. 2016), as well as declines in the ground squirrel and rabbit populations in the GSA, which they attribute to an increase in predator species, such as grizzly and black bears, foxes, wolves, eagles, and owls (Gwich'in Elders 2001). Likewise, members of the LKDFN have observed fewer berries (cranberries and blueberries) in recent years (2010-2015). Blueberries also appear to be smaller in size than in earlier years. In 2014, members observed later than usual emergence of raspberries. These trends are associated with lower rainfall (2012-2014) and increasing fire frequency. One individual said, “the land is dying” (LKDFN 2015).

Climate change

Climate change may contribute to dry or bad berry years, forest fires, flooding, as well as delayed freeze-up⁸⁷, earlier spring, hotter summers, rainy years or other extreme/unusual climatic

⁸⁶ Vegetation and even fish stocks can be destroyed/affected for some years after a forest fire (unnamed Aklavik hunter, Eddy McLeod, and John Norbert in GSCI and GRRB 2014). “...Bear tracks are not seen in an area where a forest fire has recently burned” (George Niditchie in GSCI and GRRB 2014: 56).

⁸⁷ In 2012, freeze-up in the GSA was observed to be “around two weeks late” (GSCI and GRRB 2014: 57).

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conditions. These changes could affect the seasonal behaviour or food supply of grizzly bears. For example, an earlier spring may result in grizzly bears exiting their dens too early, before adequate food is available⁸⁸. Rainy years, along with other conditions, can change river banks through erosion, making it difficult for bears to travel⁸⁹ (Ian McLeod, DSGBW 2006-11 *in* GSCI and GRRB 2014). Climate change may also be resulting in an increase in brush, making it difficult for all animals to travel, including grizzly bears (Walter Alexie *in* GSCI and GRRB 2014).

Hunting pressure

Hunting has been identified by *Gwich'in Knowledge of Grizzly Bears* (GSCI and GRRB 2014) as the main limiting factor for grizzly bears in the past. Berger (1977: 100) noted that in the 1970s all three species of bears (grizzly, black, and polar) were “hunted for food and sport, but the polar bear and grizzly bear are regarded as prize trophies...the harvest of grizzly...bears is controlled by Territorial Game Regulations.” Grizzly bears are not harvested for their meat as much as in earlier times but are still commonly taken for subsistence by harvesters or for elders. They are also hunted by sport hunters with an outfitter, and the hide is still used for traditional or taxidermy purposes as a means of income (WMAC (NWT) pers. comm. 2016). It is thought that with the current management system in place, including the tag system, “hunting does not pose a threat” (GSCI and GRRB 2014: 54). On a smaller scale, where access is easier for hunters (for example the mountains near Aklavik), it is felt that hunting remains a limiting factor – including decreasing the number of ‘larger bears’ that may have existed historically (Ryan McLeod, DSGBW 2006-11 *in* GSCI and GRRB 2014). *Gwich'in* knowledge holders have spoken about how it is getting harder to find the larger bears, possibly because of hunting pressure (GSCI and GRRB 2014). In contrast, in the Mackenzie Mountains, grizzly bear populations have been observed to be increasing, with hunters and outfitters calling for the creation of a grizzly bear hunting season (since 1982, this region has been closed to non-residents for hunting grizzly bears and resident hunters have been restricted to one bear per lifetime) (Larter and Allaire 2015).

⁸⁸ This would be the result of a mis-match in timing – for example, warm weather but roots are still frozen in the ground, or ground squirrels may not yet be out (Eddie Greenland *in* GSCI and GRRB 2014).

⁸⁹ Ian McLeod (DSGBW 2006-11 *in* GSCI and GRRB 2014: 58) noted after a rainy year with a warm spring and quick melt: “That big rain last summer really [messed] up all the creeks too. The creeks were really awful to travel on, full of rocks. Even at Willow River, at the mouth, was all washed out...If the banks are all washed out, [grizzly bears] probably can’t find routes [to travel along] anymore. It’s just straight rock now in the creek. There would be no fresh roots to dig.”

POSITIVE INFLUENCES

Existing management plans

In the ISR, grizzly bears are managed under a co-management plan (Nagy and Branigan 1998). The plan includes provisions for quotas in established community hunting areas, which are incorporated into community bylaws and regulations under the NWT's *Wildlife Act* (S.N.W.T. 2013, c. 30). The quotas were drawn from similar polar bear management quota systems, but adjusted for the lower cub survival seen in grizzly bear populations. Harvesters are encouraged to engage in a male-biased harvest and kills in defence of life or property must be reported and count towards the total quota.

A similar quota system is in place in the GSA (GRRB *et al.* 2000). Developed on a sustainable yield basis, the quota is based upon a 3-year total of 36 grizzly bears for the whole region (annual quota of 12 for three consecutive years) in the GSA. This includes subsistence harvest, defence of life or property kills, sport hunting, and illegal kills. The quota is male-biased (no more than 1/3 of the harvest can consist of female grizzly bears). The GSCI and GRRB (2014) make note of the plan as a positive influence on the grizzly bear population, responsible for restoring it to a stable place that will likely continue into the future (Eddie Greenland and Robert Alexie Sr. *in* GSCI and GRRB 2014). This is compared to the higher or unregulated harvest levels in the past: “Before they put the quota, you’d just go and shoot three or four bears and get your money” (Eddie Greenland, DSGBW 2006-11 *in* GSCI and GRRB 2014). However, not all knowledge holders in the Gwich’in agree with the management plan. Points of contention exist around hunting rights and also the ‘biology’ of the plan. For example, there is a worry that allowing grizzly bears to reproduce without being hunted may result in overpopulation (Woody Elias *in* GSCI and GRRB 2014).

Co-management

Indigenous people in the NWT have been managing wildlife since time immemorial. In modern times there are formal collaborative co-management processes established through land claim agreements throughout most of the grizzly bear’s range in the NWT. Inuvialuit collaborate with each other through Hunters and Trappers Committees, as well as with management authorities, other indigenous groups and biologists to ensure grizzly bear harvest remains sustainable; in fact, many of the harvesting rules and regulations (i.e., “by-laws”) have been self-imposed by the Inuvialuit upon their hunters to conserve grizzly bears and there are penalties that encourage hunters to abide by the rules. Similarly, in the GSA, the GRRB helps implement a voluntary tag system and grizzly bear management areas to monitor harvest. In the Sahtú Settlement Area there is an approved land use plan with protections for known grizzly bear dens. While no other formal co-management initiatives are currently underway for grizzly bear management, the co-management processes in the Inuvialuit, Gwich’in, Sahtú, and Wek’èezhìi areas ensure

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meaningful collaborative management practices when needed and as required.

Climate change

Climate change may be creating a greater amount of habitat suitable for grizzly bears, potentially explaining the increasing range observed (see *Distribution trends*, p. 65 for more details). It is noted that grizzly bears are ‘generalists’ in their eating habits, and thus they may not be overly affected by changes to the land caused by climate change (Abe Peterson, Eddie Greenland, and William Modeste *in* GSCI and GRRB 2014). The GSCI and GRRB (2014) note that warmer autumns may allow bears to stay out longer, and a population increase may result as the mating season is extended.

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For permission to reproduce Figure 4 (p. 66), we thank the Inuvialuit Joint Secretariat.

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Scientific Knowledge component

SPECIES OVERVIEW

Names and classification

Scientific Name:	<i>Ursus arctos</i> Linnaeus (1758), subspecies <i>U. a. horribilis</i> Ord (1815)
Common Name (English):	Grizzly bear, brown bear
Common Name (French):	Ours brun
Populations:	Single continuous population, occurring in mountains, subarctic taiga, and low Arctic tundra, including some islands of the Arctic Archipelago in the Northwest Territories (NWT).
Synonyms:	None
Class:	Mammalia
Order:	Carnivora
Family:	Ursidae
Subfamily:	Ursinae
Life Form:	Animal, vertebrate, mammal, carnivore, bear

Systematic/taxonomic clarifications

Classification of *Ursus arctos* at one time included up to 90 species or subspecies (reviewed in Pasitchniak-Arts 1993), including two specific to the NWT (*U. richardsoni* [from specimens collected along the coast of the Arctic Ocean in the eastern NWT] and *U. russelli* [obtained at the Mackenzie River delta]). Rausch (1963) reduced this array to include two subspecies for North America, of which only one is found in the NWT; *U. a. horribilis*, which generally describes the smaller, interior grizzly bear common to most of the continent (the other, *U. a. middendorffi*, describes the very large brown bears from Kodiak Island). Subsequent molecular analyses maintained this level of separation within the species (Waits *et al.* 1998; Paetkau *et al.* 1998; Miller *et al.* 2006).

Description

The grizzly bear of the NWT (Fig. 5, below) is a large bear with anatomical features typical of most ursids (members of the bear family), including: large body mass; plantigrade locomotion (walking with the entire sole of the foot on the ground); clawed, five-toed feet; and a heavy skull with long canine teeth and bunodont (crushing) molars. The grizzly bear is distinguished from black bears (*U. americanus*) and polar bears (*U. maritimus*), which also inhabit the NWT, by its pelage and the large shoulder muscles that give the species its characteristic ‘hump’ (Fig. 5, below), a skull shape that presents as a concave forehead and nose bridge (Fig. 5, below), and claws that are longer in comparison to those of other bears (up to 10 centimetres [cm] in length). Colouration is typical of grizzly bears inhabiting mountainous and barren-ground regions of North America (Schwartz *et al.* 2003a), and includes shades of light brown or cream to dark brown, often with guard hairs on the shoulders and back tipped with a lighter shade (white, grey, golden, or silver) to give the fur a ‘grizzled’ appearance (and the species its namesake).



Figure 5. Grizzly bear family group (*U. a. horribilis*) (credit: Catherine Elizabeth D. Graydon, used with permission).

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Body mass of adult female grizzly bears (generally classed as animals aged 5+ years) in the NWT ranges from approximately 100-150 kilograms (kg). Reported average masses include 110 kg (range 81-125 kg, $n = 28$) for the Mackenzie Mountains (samples from June-September during 1973-1977; Miller *et al.* 1982); 112 kg ($n = 29$) for northeast of Great Bear Lake (samples from May-July during 1988-89 and 1990-91; Case and Buckland 1998); and 124 kg ($n = 36$) for the Tuktoyaktuk Peninsula (using spring weights; Nagy *et al.* 1983a). Grizzly bears in the Lac de Gras area along the NWT/West Kitikmeot border averaged 120 kg for all capture events of bears aged 5-25 (samples from May to September; range 80-199 kg, $n = 88$; 1990-2003) (Gau pers. comm. 2015), while in a study area stretching from north of Yellowknife to south of Kugluktuk (Nunavut) and between the Coronation Gulf in the east and Great Bear Lake in the west, average female body weight (including animals 0.17 to 28.5 years of age) was 111 kg (samples from May to July during 1982-2008; $n = 99$; Bartareau *et al.* 2011). In the Richardson Mountains and Brock-Hornaday rivers area (1992-1993), Nagy and Branigan (1998) report that the largest females captured in spring were 132 kg and 145 kg, respectively. Note that elsewhere in North America, female bears can weigh much more than values reported for the NWT and in excess of 200 kg (e.g., southwest Alaska) (McLellan 1994; Ferguson and McLoughlin 2000; Schwartz *et al.* 2003a). Body length (snout-tail) averaged 164 cm (range 151-185, $n = 20$) for adult females in the Mackenzie Mountains (Miller *et al.* 1982) and 172 cm for the northeast barrens (range 159-191 cm, $n = 31$) (Gau pers. comm. 2015).

The largest grizzly bear yet recorded in the NWT was from the Arctic Archipelago in May 1991: a 320 kg adult male captured 60 kilometres (km) south of Dundas Peninsula, Melville Island (Taylor 1995). Throughout their range in North America, adult male grizzly bears are reported to average approximately 1.8 times the weight of females (Hilderbrand *et al.* 1999a). Adult males of the Mackenzie Mountains in the study of Miller *et al.* (1982) were lighter than expected from this multiplier, averaging 148 kg (range 108-213 kg, $n = 20$). However, this does not appear to be the case in the central barrens of the NWT: adult male grizzly bears averaged 172 kg compared to 106 kg for females (range 103-261 kg, $n = 28$) (data from males captured in 1995-1998, Gau pers. comm. 2015). Body length (snout-tail) averaged 176 cm (range 160-204 cm, $n = 18$) for adult males in the Mackenzie Mountains (Miller *et al.* 1982) and 196 cm for the central barrens (range 171-230 cm, $n = 36$) (Gau pers. comm. 2015). The largest male in Nagy and Branigan's (1998) reference to grizzly bears of the Richardson Mountains weighed 213 kg in spring; for the Brock-Hornaday rivers area the maximum weight was 236 kg.

Distribution

World or continental distribution

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2012) presents current data on the holarctic distribution (throughout the northern continents of the world) of

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grizzly bears, which includes populations in some 48 countries including Canada, the United States, and across northern Asia (including a sizeable population in Russia) and in some parts of continental Europe (where the species is more commonly referred to as the brown bear). In North America, which, as discussed in *Systematic and Taxonomic Clarification* (p. 76) consists of two subspecies, range contraction in the contiguous United States has resulted in only six isolated populations of grizzly bears remaining south of Canada, four of which persist along the Canada-United States border (Proctor *et al.* 2005; Fig. 6, p. 80). Since the early 19th century, grizzly bears have been eradicated from 98 percent (%) of the species' range in the lower 48 states (Servheen 1999). The recent historical distribution in North America included much of western and northern Canada, with the grizzly bear being naturally excluded from central and eastern boreal forests. COSEWIC (2012) reports no significant changes in Canadian distribution since their original assessment of the species in 1991 (Banci 1991), excepting expansion of the species' range northward into the Canadian Arctic Archipelago, including those islands of the NWT (Banks, Victoria and Melville islands) where grizzly bears are occasionally encountered.

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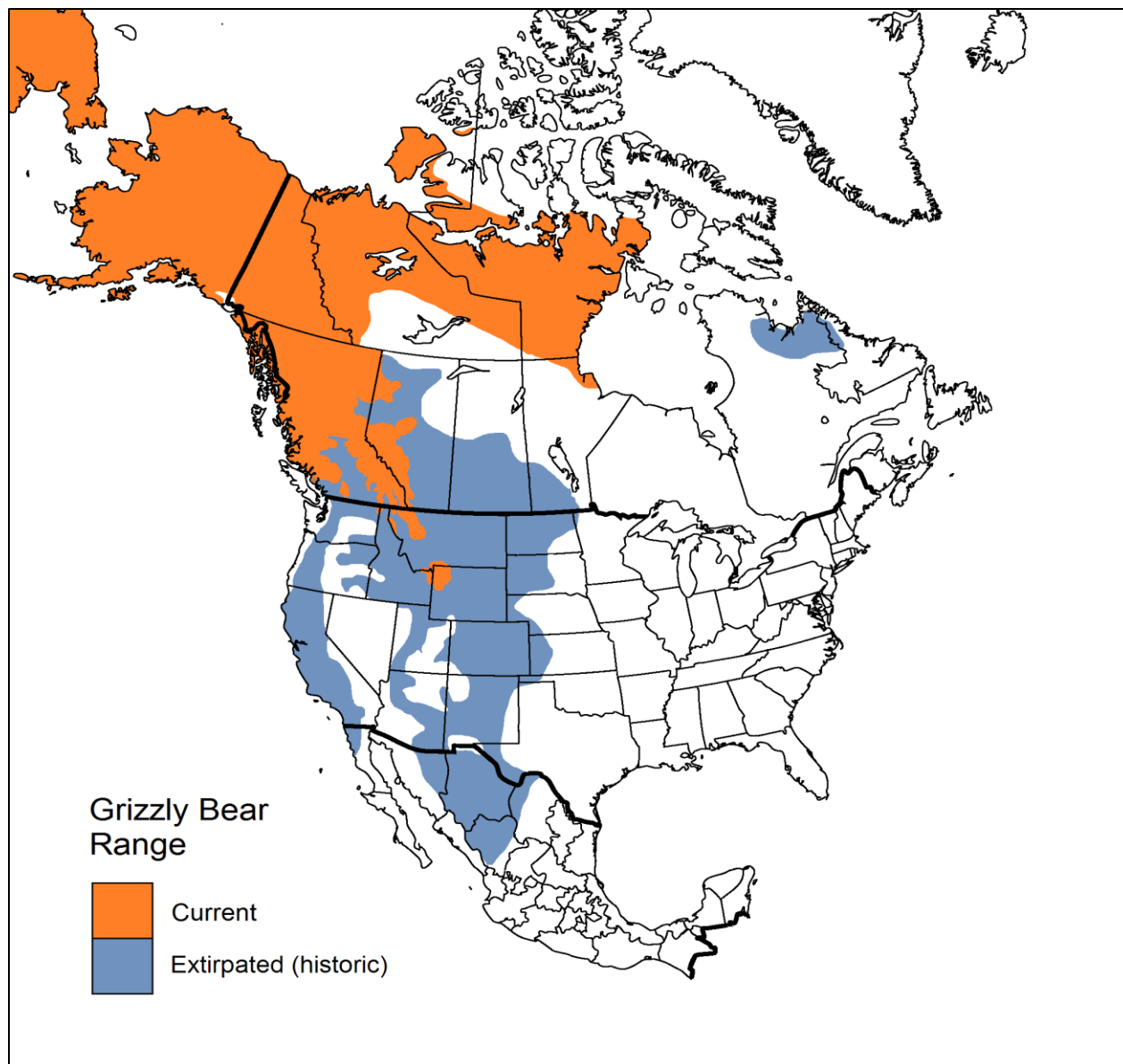


Figure 6. Approximate boundaries of the current and historic (i.e., 19th century) distribution of grizzly bears in North America, based on the map produced by P.D. McLoughlin for COSEWIC (2012). Areas in white are not known to have supported more than vagrant occurrences of grizzly bears in the past (including hot deserts, highly glaciated mountain ranges, Canadian shield, islands, Taiga and Boreal Plains, and some highly productive coastal forests). Sources used to develop this map include McLoughlin (2001), Mattson and Merrill (2002), Hamilton *et al.* (2004), Proctor *et al.* (2005), Doupé *et al.* (2007), Loring and Spiess (2007), Environment Canada (2009), Rockwell *et al.* (2008), Alberta Sustainable Resources Development and Alberta Conservation Association [ASRDACA] (2010), various jurisdictional ecoregion maps (e.g., Wiken 1986), Aboriginal traditional knowledge as cited in COSEWIC (2012), Gau pers. comm. (2011), and Klinkenberg (2014).

NWT distribution

The distribution of grizzly bears in the NWT (subspecies *U.a.horribilis*, as discussed in *Systematic and Taxonomic Clarifications*, p. 76) is continuous (Fig. 7, p. 81); however, movements are not homogenous across the species' range and spatial heterogeneity exists (e.g.,

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McLoughlin *et al.* 2002a, c, 2003a; Edwards *et al.* 2009). Both McLoughlin *et al.* (2002c) and Edwards *et al.* (2009) argue that subpopulation distinctions based on animal movements can be ecologically meaningful for research and management. Nonetheless, from a status perspective (i.e., in terms of assigning evolutionary significant, designatable units) there are no subpopulations of grizzly bears considered to be particularly isolated from each other within the NWT.



Figure 7. Grizzly bear distribution across the NWT (hatched lines represent areas of increased presence). Map courtesy B. Fournier, Environment and Natural Resources (ENR).

The estimated extent of occurrence (EO) for grizzly bears in the NWT is the area contained within the shortest continuous boundary drawn to encompass all the known, inferred or projected sites of present occurrence of the species. The estimated EO is 1,952,699 km², which includes both Great Bear Lake and the portion of the Arctic Ocean that occurs within the polygon. The area of occupancy (AO) is defined as the area within the EO that is occupied by the species,

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excluding cases of vagrancy. It reflects the fact that the EO may contain unsuitable or unoccupied habitats. The AO is estimated as 878,204 km², which excludes the Taiga Plains south of Great Bear Lake and east of the Mackenzie Mountains to Great Slave Lake and south to the Alberta border, and Taiga Shield south of the treeline on the central barrens to the border with Saskatchewan, as well as Great Bear Lake and the Arctic Ocean. The index of area of occupancy (IAO) is a measure that aims to provide an estimate of area of occupancy that is not dependent on scale (Species at Risk Committee [SARC] 2015). Due to the wide-ranging habits and continuous distribution of grizzly bears, AO and IAO are the same.

Location(s)

The term ‘location’, with respect to status, defines a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the species present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. There is one continuous population of grizzly bears that may be subject to several different management regimes. Harvest management may therefore be used as a proxy for how the most serious plausible threat (human-caused mortality) may affect grizzly bears, since harvest management may differ throughout the NWT. The NWT is divided into six wildlife management zones (*Wildlife Management Zones and Areas Regulations* 2009). Each of these zones may be further divided; for instance, there are six grizzly bear management areas in the Inuvialuit Settlement Region (ISR), each with its own quota. Therefore, the number of ‘locations’ that are possible exceeds the threshold of 10.

Search effort

Grizzly bears, due to their distinctive traits and tracks, and potential to come into conflict with humans, are very unlikely to go unnoticed by people if present in an area; hence, data on current distribution is likely to be accurate. Indeed, such is the high-profile nature of the species that its presence has been noted since the very earliest of written accounts of the biogeography of the NWT. For example, Samuel Hearne described grizzly bears in the eastern NWT during his overland voyages to the Arctic Ocean from 1769-1772 (Hearne 1795), and later explorers such as Mackenzie, Franklin, and Richardson (Richardson 1829; Mackenzie 1911; Johnson 1975) also wrote about the presence of grizzly bears during their expeditions. Recent sightings of the species can be of both scientific and popular interest (e.g., new sightings of grizzly bears in the Arctic Archipelago where they were not previously known to occur) (Doupé *et al.* 2007).

Contemporary reports of grizzly bear occurrence in the NWT, including Global Positioning System (GPS) or Argos satellite-based telemetry projects, exist for the central barrens (e.g., McLoughlin *et al.* 1999, 2002c, 2003a; Gau *et al.* 2004) and Tuktoyaktuk (Edwards 2006, 2007, 2009; Edwards *et al.* 2011, 2013), with earlier very high frequency (VHF)-based radio-collar studies of grizzly bears having been conducted near Tuktoyaktuk (1974-78; Nagy *et al.* 1983a),

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in the Mackenzie Mountains (1973-77; Miller *et al.* 1982), and in the Anderson-Horton rivers area (1987-1992; Clarkson and Liepins 1989, 1992, 1993, 1994). Grizzly bear mark-recapture studies were also conducted in the Richardson Mountains (1992-93; Nagy and Branigan 1998) and the Brock-Hornaday rivers area (1992-93; Nagy and Branigan 1998). Reports on human interactions with grizzly bears are documented annually by the GNWT (see *Threats and Limiting Factors*, p. 102); the latter can also serve as an index of grizzly bear distribution in the NWT (e.g., the lack of grizzly bears in the harvest or problem-kill records of the South Slave region of the NWT over the past ten years (Vermillion pers. comm. 2014), which suggests that the species is not generally found in the area).

For this report, search effort relied on capture locations, telemetry studies, and observations as reported in the published and unpublished literature, including the recent COSEWIC assessment of grizzly bears (COSEWIC 2012). No specific surveys were conducted for this report.

Biology and behaviour

Habitat requirements

Grizzly bears in the NWT occur across a range of habitats, from low elevation barrens along the coast of the Arctic Ocean and northeast of the treeline to the Nunavut border, to islands of the Canadian Arctic Archipelago, to subarctic taiga and high elevation alpine habitat as found in the Mackenzie Mountains. Habitat associations for grizzly bears are strongly seasonal and typically reflect local vegetation phenology and, in mountainous regions, elevation (Miller *et al.* 1982; Schwartz *et al.* 2003a). The wide distributional range of the species reflects their generalist approach to both habitat selection and diet (McLoughlin *et al.* 2000).

Seasonal habitat requirements for grizzly bears in the NWT are derived from physiographic and vegetative description studies of habitat using remote sensing and comparison of used vs. available habitat from telemetry observations using resource selection functions (RSFs) (Manly *et al.* 2002), or, for earlier studies, simpler analyses based on comparison of use/availability ratios. Most research on habitat requirements applies to grizzly bears of the east-central barrens (e.g., McLoughlin *et al.* 2002a, b, 2003a; Johnson *et al.* 2005), Mackenzie River delta (e.g., Nagy *et al.* 1983a; Edwards 2006, 2007), and the Anderson-Horton rivers area (Clarkson and Liepins 1994); however, Miller *et al.* (1982) also present a ratio-based analysis for bears of the Mackenzie Mountains.

Miller *et al.* (1982) suggested that for bears of the Mackenzie Mountains, habitat use was likely correlated with plant phenology, with bears in spring first frequenting snow-free areas and then following the emergence of green vegetation into higher elevations. By summer, some bears would move back to lower elevations with the ripening of berry crops and increase in biomass of *Hedysarum alpinum* roots (bear root) (which made up 86% of recorded bear diets). This is followed by movements back into higher elevations later in the year to areas where late fall

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berries lag in ripening, and bears den. Forested, low elevation areas – although used – were not strongly selected for in comparison to alpine and subalpine habitats. Similarly, Weaver (2006), in a hair-snagging study in the Mackenzie Mountains, found grizzly bears selected for subalpine/alpine areas over lower elevation forested areas.

McLoughlin *et al.* (2002a) documented habitat selection by barren-ground grizzly bears of the central barrens of mainland NWT (and West Kitikmeot). Using RSFs, habitat selection was demonstrated at both Johnson's (1980) second and third orders of selection (i.e., among home ranges and within home ranges, respectively). The general pattern was for bears to preferentially select esker habitat, tall shrub riparian habitat, tussock/hummock successional tundra, and lichen veneers relative to other available habitat types for both orders of selection. Although habitats selected at the second order (coarser scale) were largely also selected at the third order (finer scale) of selection, scale differences in habitat selection patterns were documented. For example, some habitats, such as tall shrub riparian habitat, which was only moderately preferred at the coarser order of selection, became highly preferred at the finer order of selection. Also, no differences in habitat selection patterns between males, lone females, and females with accompanying young were found to occur at the third order of selection. McLoughlin *et al.* (2002a) point out that these results underscore the importance of acknowledging scale dependence in habitat selection. Relative to models by McLoughlin *et al.* (2002a), Johnson *et al.* (2005) used the same sample of collared bears and, though using different methods, produced agreeable results.

Similar to McLoughlin *et al.* (2002a), Edwards (2006) showed that habitat selection models for male grizzly bears of the Mackenzie River delta generally favoured low shrub lowland and tall shrub habitat compared to other habitat types throughout the active season. Female grizzly bears showed stronger selection patterns, and selected sparse vegetation, tall shrub, closed spruce forest, low shrub uplands, and wet herbaceous habitats early in the year (to beginning of August). From August to the end of September sparse vegetation and low shrub lowland (which are relatively more wet compared to low shrub uplands) were favoured, while low shrub lowland and sparse vegetation, but also closed spruce forest and tall shrub, were selected in October through denning. East of the Mackenzie River delta, in the Anderson-Horton rivers area, bears appear to concentrate along river and creek valleys (Clarkson and Liepins 1994).

In addition to timing and duration of denning (discussed in *Physiology and adaptability*, p. 92), habitat requirements for denning and choice of den site may have adaptive significance for grizzly bears. Grizzly bears use stored fat to survive during winter, and the ability to minimize loss of body fat during dormancy in part determines a bear's ability to survive during winter (Folk *et al.* 1972). Apart from decreasing metabolic rate, grizzly bears can minimize energy loss to the environment during dormancy by choosing the most appropriate sites for denning. The best sites for denning may depend on several factors, including den aspect, slope, and habitat characteristics such as vegetation cover and soil substrate.

In the Mackenzie Mountains, Miller *et al.* (1982) documented 17/22 winter dens of tracked

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grizzly bears occurring in alpine habitat above 1,520 metres (m). Aspect was predominantly southeast. On the central barrens, a generally southern aspect of den entrances was also observed by McLoughlin *et al.* (2002b), which agrees with earlier descriptions of grizzly bear dens in the NWT/West Kitikmeot (i.e., Mueller 1995; Banci and Moore 1997) and the Arctic Coastal Plain (e.g., Slaney and Company Ltd. 1975; Harding 1976; Reynolds 1976). A southern aspect may take advantage of radiant heat from sunlight in the spring and fall and northerly prevailing winds during winter, the latter of which can produce large snow banks on lee slopes to the south. Large snow banks covering den entrances likely serve to protect and insulate dens. In contrast, Smereka *et al.* (2016) found that Mackenzie Delta grizzly bears, in addition to selecting for southeastern and southerwestern slopes, also selected for northern slopes. It is thought that the low autumn and winter solar input of the region may make aspect selection less important than other habitat characteristics such as vegetative cover (Smereka *et al.* 2016).

Like slopes of dens recorded for bears in the Mackenzie Mountains (31-38°; Miller *et al.* 1982), the average slope into which dens of bears on the central barrens (McLoughlin *et al.* 2002b) were excavated was steep (>25°). Dens may be easier to dig on steep slopes, where soil may be exposed early in spring to sunlight and warm ambient air resulting in a deeper layer of thawed soil above permafrost than in more level areas. Reynolds (1976) observed that 75% of 52 grizzly bear dens in the eastern Brooks Range, Alaska, were excavated in well-drained areas above the permafrost layer. In addition, den excavation on steep slopes may allow for dens to be constructed on near-horizontal or even upward-facing slopes, creating a warm-air trap in nest cavities (Harding 1976). Steep, southerly-facing slopes also often produce well-developed patches of dwarf birch (*Betula* spp.) and berry-producing shrubs. In McLoughlin *et al.* (2002b), dwarf birch and crowberry (*Empetrum nigrum*) had the highest percent coverage of any plant species around den entrances, while Smereka *et al.* (2016) found den selection in areas with low shrubs, particularly willows (*Salix* spp.) and alder (*Alnus* spp.). The roots of these shrubs may add to the structural integrity of den cavity ceilings and by acting as windbreaks, may also encourage the build-up of snow cover, providing insulation to the den (Smereka *et al.* 2016). Mats of crowberry were also the main component of the insulating bedding material found in the majority of grizzly bear dens. The high presence of grasses around dens in McLoughlin *et al.*'s (2002b) study may be attributed to the colonizing abilities of these plants after disturbance.

Dens in the Mackenzie Mountains were located primarily in dark chernozemic soils (typically grassland soil with high organic matter content) (Miller *et al.* 1982). In the Mackenzie Delta, dens were typically located in sedimentary deposits (i.e., rolling moraine, colluvial deposits, alluvial plain, alluvial terrace, alluvial fan, and glaciofluvials) (Smereka *et al.* 2016). Harding (1976) examined 23 grizzly bear den sites on Richards Island, NWT, where most were situated in river or lake banks, in Pleistocene uplands, and in silty or sandy soil. Grizzly bears of the central barrens appear to den in mainly sandy soil, sometimes with silt-clay and cobble content (McLoughlin *et al.* 2002b). Studies of the denning ecology of barren-ground grizzly bears previous to McLoughlin *et al.* (2002b) suggested that large glaciofluvial deposits such as eskers

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were extremely important for grizzly bear denning habitat (e.g., Mychasiw and Moore 1984; Mueller 1995; Banci and Moore 1997). For example, Mueller (1995) reported that 29 of 32 bear dens encountered during surveys (91%) were located in eskers, when esker habitat was expected to make up 1.5% of the surrounding landscape. Banci and Moore (1997) reported finding 34 of 52 bear dens (65%) in eskers, mainly from unknown and uncollared bears. Such exclusive use of esker habitat for denning was not supported by data obtained from radio-collared grizzly bears in McLoughlin *et al.* (2002b). Although bears did den in eskers or other glaciofluvial habitats such as kames and drumlins, and they did so to an extent greater than expected by chance, the use of eskers reported by McLoughlin *et al.* (2002b) was considerably less than what was previously reported in the NWT/West Kitikmeot. Similarly, Smereka *et al.* (2016) found the highest concentrations of grizzly bear dens in the Mackenzie Delta to be associated with wetlands (immediately along the banks of wetland habitats). Despite the proximity to water, the dens were nonetheless located in dry sites.

Movements

In general, movements (home ranges, directions, movement rates) are tied to age, sex, and habitat or feeding requirements; the latter may include seasonal migrations in elevation (as described above for the Mackenzie Mountains; Miller *et al.* 1982), or movements related to the composition of habitat in the home range (McLoughlin *et al.* 2003a) and seasonally available food sources including prey like caribou (Gau *et al.* 2004). Subadult male grizzly bears usually disperse upon independence, whereas subadult females are commonly philopatric (staying in their home range) (LeFranc *et al.* 1987; Blanchard and Knight 1991). Dispersal in grizzly bears is a gradual process, taking 1-4 years (McLellan and Hovey 2001).

Productivity and seasonality of the environment are known predictors of grizzly bear home range size and overlap when compared across North America (McLoughlin and Ferguson 2000; McLoughlin *et al.* 2000). Home ranges of grizzly bears in the NWT (Table 4, p. 87) include the largest ranges reported for the species (McLoughlin *et al.* 1999, 2003a; Gau *et al.* 2004). Especially impressive are the wide-ranging movements of subadult male grizzly bears in the central barrens (Gau *et al.* 2004), where movements between the Lac de Gras area and the Coronation Gulf can result in ranges exceeding 32,000 km² in a single year ($\bar{x} = 11,407 \text{ km}^2$, $n = 8$). Near Tuktoyaktuk, home ranges of grizzly bears were shown to exhibit temporal drift and low site fidelity (Edwards *et al.* 2009), as expected from the low productivity and high seasonality (temporal heterogeneity) of the environment (McLoughlin *et al.* 2000). In the Mackenzie Mountains, Weaver (2006) estimated male home ranges over 2,000 km², based on results of hair-snagging. Sex-related differences are well documented for grizzly bear home ranges across North America (e.g., Nagy and Haroldson 1990; McLoughlin *et al.* 1999; COSEWIC 2012) and for several study areas in the NWT (Table 4, p. 87). Grizzly bears can be expected to show seasonal changes in size of home ranges, as illustrated by McLoughlin (2001) and reproduced as Figure 8 (p. 88).

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Grizzly bears in the Low Arctic tundra of the NWT are known to be some of the fastest moving bears in North America, which likely couples to their very large range sizes (see McLoughlin *et al.* 2003a; Gau *et al.* 2004). Movement rates are seasonal and age- and sex-dependent, with females moving at slower rates than the more wide-ranging males, and males expected to move at higher rates early in the year as they disperse (if young) or search for mates (Figure 9, p. 89). Working with bears in the Mackenzie River delta near Tuktoyaktuk, Edwards *et al.* (2011) examined within-population differences in the foraging patterns of males and females and the relationship between level of carnivory (derived from analysis of stable nitrogen isotope [$\delta^{15}\text{N}$] measurements) and individual movement. The range of $\delta^{15}\text{N}$ values in hair and claw samples (2.0-11.0%) suggested a wide niche-width, while cluster analyses indicated the presence of three foraging groups within the study area, ranging from near-complete herbivory to near-complete carnivory. Although Edwards *et al.* (2011) found no relationship between home range size and trophic position, the movement rate of females increased linearly with trophic position (i.e., more carnivorous bears moved more frequently).

Daily rhythms (regular patterns) of activity and inactivity displayed by grizzly bears are reviewed in LeFranc *et al.* (1987). Grizzly bears can be expected to be active from early evening to early morning with crepuscular (twilight) peaks in daily activity.

Currently, there are no documented barriers in the dispersal and migration routes of grizzly bears in the NWT, except what we might expect for large lakes and oceans (re: northward migration of grizzly bears into the Arctic Archipelago). Bears will travel on sea ice however, and are able to move among arctic islands on the sea ice (e.g., Doupé *et al.* 2007).

Table 4. Estimated mean size of annual home ranges for male and female radio-collared grizzly bears in the NWT.

Study Area	Source	Males		Females	
		km ²	n	km ²	n
Anderson-Horton rivers area	Clarkson and Liepins (1989)	3,433	7	1,182	14
Eastern barrens	McLoughlin <i>et al.</i> (2003a) ^{a,b}	7,245	26	2,100	45
Mackenzie Mountains	Miller <i>et al.</i> (1982)	n/a	n/a	265	6
Mackenzie River delta ^d	Edwards <i>et al.</i> (2009) ^b	1,215	11	680	43
Tuktoyaktuk Peninsula	Nagy <i>et al.</i> (1983) ^c	1,154	7	670	n/a

^a Excludes subadult male grizzly bear home ranges (see Gau *et al.* (2004) for subadult ranges).

^b Kernel-based home range estimates (95% fixed kernels). All other estimates are based on minimum convex polygons.

^c Weighted means cited in Nagy and Haroldson (1990).

^d This area includes the Mackenzie River Delta, but also the area east of the Delta from Inuvik to Tuktoyaktuk.

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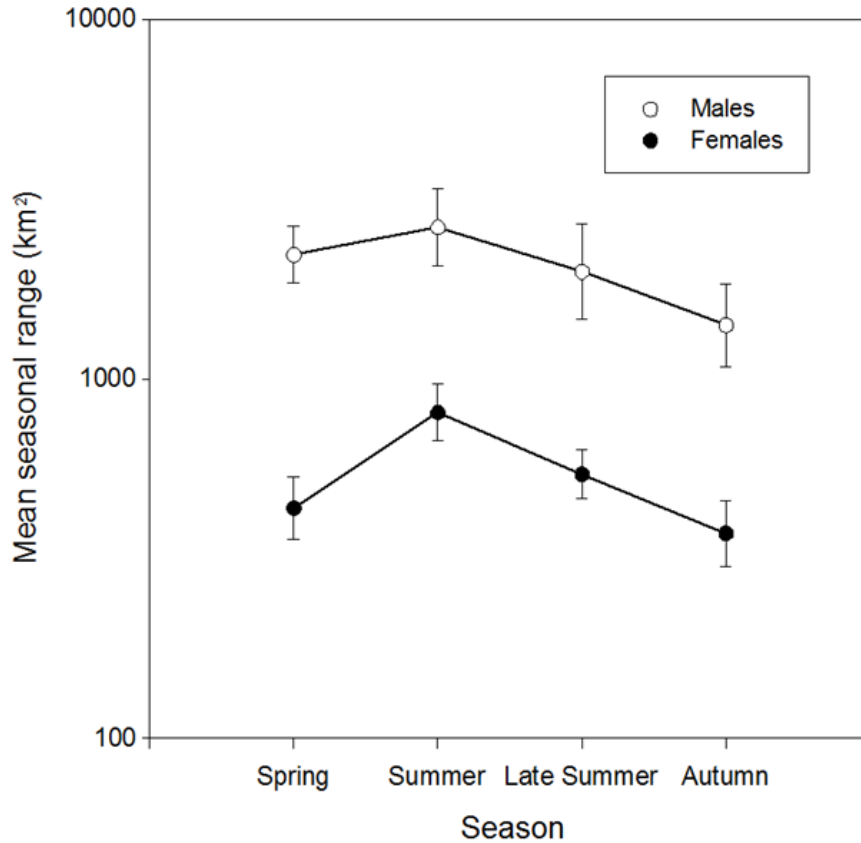


Figure 8. Seasonal minimum convex polygon ranges of grizzly bears in the central barrens of the NWT/West Kitikmeot, 1995-1999 where spring = den emergence-June 20; summer = June 21-July 31; late summer = August 1-September 9; and autumn = September 10-den entrance. Means are based on data log-transformed to the base 10. Error bars are ± 1 SE. Data reprinted with permission from McLoughlin (2001).

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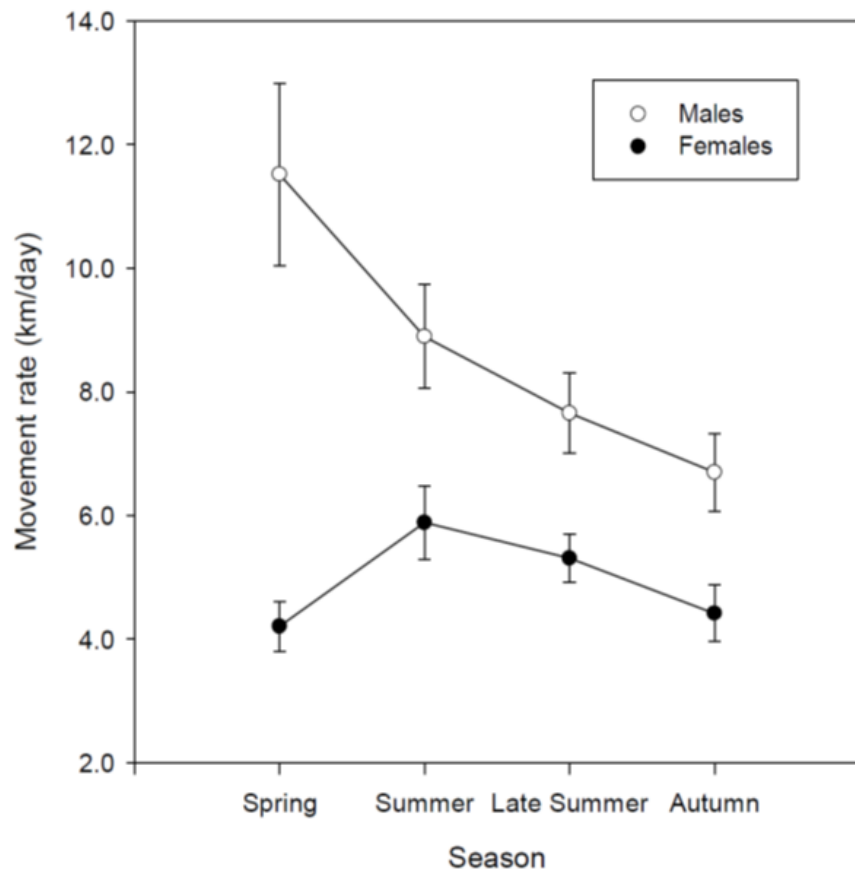


Figure 9. Seasonal movement rates of grizzly bears in the central barrens of the NWT/West Kitikmeot, 1995-1999 where spring = den emergence-June 20; summer = June 21-July 31; late summer = August 1-September 9; and autumn = September 10-den entrance. Error bars are ± 1 SE. Data reprinted with permission from McLoughlin *et al.* (1999).

Life cycle and reproduction

Cubs of grizzly bears are born in winter dens in litters of usually between 1-3 cubs (also see Table 6, *Population dynamics*, p. 99), and at birth weigh approximately 500 grams (g) (COSEWIC 2012). They are nursed inside the den of the mother until sometime between the end of February and the beginning of May, depending on latitude (e.g., in the central barrens of the NWT, females emerge from dens as late as the first week of May [McLoughlin *et al.* 2002b]). Cubs are often weaned as yearlings but in some cases as two-year-olds (COSEWIC 2012).

Case and Buckland (1998) observed weight of female barren-ground grizzly bears captured northeast of Great Bear Lake not to reach much larger measurements after eight years of age, and straight line body length, skull width, and skull length of female bears not to reach much larger measurements by six years. About 90% of body length was reached around age three. They compared their results to female grizzly bears from three other northern populations studied by Kingsley *et al.* (1988) (Tuktoyaktuk Peninsula/Richards Island in the NWT, Arctic mountains in the northern Yukon, and Brooks Range in northwestern Alaska), where about 90% of body

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length was reached around age four, a full year later (Kingsley *et al.* 1988). A subsequent study by Bartareau *et al.* (2011) including bears from both the NWT and Nunavut (from north of Yellowknife to south of Kugluktuk, between the Coronation Gulf in the east and Great Bear Lake in the west) estimated that 90% of body length was reached at 2.8 years for females and 4.6 years for males, and 90% of spring body mass was reached at 6.9 years for females and 12.4 years for males. Kingsley *et al.* (1988) also found that bears approached their maximum weight later than their maximum length.

Kingsley *et al.* (1988) reported that male grizzly bears in northern environments (including data from Tuktoyaktuk Peninsula and Richards Island) reached their maximum length 0.7 to 1.7 years later than females, and had asymptotic lengths 10-15% greater. Males reached near maximum weights that were 80-100% greater than females. Bartareau *et al.* (2011) had similar observations in asymptotic body length, with males being on average 12.9% longer than females. However, their estimates of asymptotic mass showed males reached weights that were 46.5% heavier than females. Although male grizzly bears have been known to reach physiological maturity at 3.5-5.5 years of age (White *et al.* 1998, 2005), younger adults are not likely to reproduce because older males prevent them from doing so. In the study area of Craighead *et al.* (1995) from the Brooks Range of Alaska, prime breeding condition for males was from ages 9-18: a full one-third of cubs with known fathers were sired by males 9-11 years old, and only one male over 18 years bred successfully.

Hilderbrand *et al.* (1999b) and Ferguson and McLoughlin (2000) showed that age at first reproduction and the inter-birth interval for female grizzly bears are variable and influenced by habitat. Age at first reproduction is also related to body size, and body size is predicted from environmental factors such as primary productivity (Ferguson and McLoughlin 2000). The grizzly bear population in the NWT includes the northernmost extent of the species' range in North America; further, the population is characterized by relatively low density and small bears that live in areas of low productivity and high seasonality (Ferguson and McLoughlin 2000; McLoughlin *et al.* 2000). Hence, we might expect a later age at first reproduction for grizzly bears in the NWT relative to more southern interior populations of grizzly bears. Indeed, whereas successful first breeding has been documented for females as young as 3.5 years in the Rocky Mountains (Aune *et al.* 1994; Wielgus and Bunnell 1994), it may occur in animals as old as 9.5 years in the eastern NWT (Case and Buckland 1998). McLoughlin *et al.* (2003b) noted that mean age at first reproduction in the eastern barrens (8.1 years) is late compared to other grizzly bear populations (Table 2 in Case and Buckland 1998; Table 1 in Ferguson and McLoughlin 2000). The earliest age at which a female was observed to produce a cub in McLoughlin *et al.*'s (2003b) study was five years, indicating successful mating at age four. Comparative data on age at first reproduction for NWT bears are presented in Table 6, under the section on *Population dynamics*, p. 99.

Senescence (approaching an advanced age) in wild grizzly bears is not often observed because of human-caused mortality (Schwartz *et al.* 2003b). Using data from 20 grizzly (brown) bear

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populations from Sweden, Alaska, Canada, and the continental United States, Schwartz *et al.* (2003b) showed that in the absence of human-caused mortality, female grizzly bears are expected to undergo major shifts in litter production around ages 4-5 (maturation) and then again at 28-29 years of age (senescence). Whereas in much of North America few grizzly bears may live to this age, senescence likely remains a component of grizzly bear life history in the NWT (where rates of human-caused mortality are relatively low, see *Threats and Limiting Factors*, p. 102). For example, in the Richardson Mountains (1992-1993) the oldest female and male grizzly bears were 27 and 29 years old, respectively; at the Brock-Hornaday rivers area (1992-1993), maximum ages of 26 and 27 for females and males were reported (Nagy and Branigan 1998). In the southern Mackenzie Mountains a male of 22 years was the oldest from a small number of defense kills from 2003-2015 (Larter pers. comm. 2016). The oldest female in the study of McLoughlin *et al.* (2003b) produced a cub at age 26 and was observed with a yearling just prior to her death the next year.

Generation length, defined as the average age of parents in the population, is generally accepted to be 10-15 years for a grizzly bear population (COSEWIC 2012). Ages of breeding animals are difficult to determine for grizzly bears, and no precise estimate exists for the average age of parents of the current grizzly bear population in the NWT. However, 10-15 years is likely to be an acceptable range. For grizzly bears of the east-central NWT, for example, average age of captured females for which age could be determined (from tooth cementum analysis) was 13 years ($n = 12$, range = 5-20.5) (McLoughlin unpubl. data 1999).

Survival rates are presented in *Population dynamics*, p. 99. Causes of death are discussed in more detail under *Threats and Limiting Factors*, p. 102, further to natural deaths including accidents, injury, senescence and starvation, and intraspecific predation for food and infanticide (COSEWIC 2012). However, human-caused mortality (e.g., due to subsistence and sport hunting, accidents, defence kills) is observed throughout all parts of the species' range in the NWT and can be a significant component of survival. Males often have lower total survival than females due to sex-selective hunting (see *Threats and Limiting Factors – Human-caused mortality*, p. 102, for further information).

The sex and age structure of grizzly bear populations will be influenced by reproductive rates and by the management regime to which a population is subjected (COSEWIC 2012). Bears of breeding age in a population with human-caused mortality comprise approximately 50% of the population (e.g., Garshelis *et al.* 2005), with the remainder being cubs, yearlings, and subadults. In the Mackenzie Mountains, Larter and Allaire (2015) reported that from 1996-2014, a period of relatively low harvest, cubs and yearlings likely made up 12.4-29.0% (mean 19.9%) of grizzly bears reported by guides/hunters. McLoughlin (2001) assembled data on captured grizzly bears ($n = 283$ bears) from the central barrens of the NWT and Nunavut: the standing age structure from 1988-1999 included 14.5% cubs of the year, 13.8% yearlings, 15.5% subadults (ages 2-4), and 56.2% adults (ages 5+). Sex ratios varied in younger age categories but were assumed to be 50:50 at birth; for adult age categories however, there were three times as many females as males

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(106 females vs. 53 males). Detailed harvest data are available in the NWT (see *Threats and Limiting Factors*, p. 102), but harvest numbers may differ considerably from the standing age and sex distribution of living animals. For example, the harvested age structure for the central barrens (McLoughlin 2001), in contrast to the age and sex structure of the capture, was strongly male-biased: for adults there were 28 females vs. 84 males killed (20 females vs. 46 males for subadults, and very few cubs or yearlings in the harvest sample). These ratios and differences between harvest and standing age-sex distributions are expected for grizzly bears, where females with young are killed at reduced rates due to biological differences (e.g., ranging habits of dispersing subadult males vs. philopatric females) and protections afforded females and cubs from hunting (see *Threats and Limiting Factors*, p. 102).

Physiology and adaptability

COSEWIC (2012) points out that the most notable aspect of grizzly bear physiology, in the context of assigning status to the species, are the vulnerabilities presented by denning (hibernation or dormancy). These vulnerabilities may be particularly important in areas like the NWT where winters are long and cold. Unlike in some parts of grizzly bear range in North America (see COSEWIC 2012 for a review of denning duration), all bears of the NWT are expected to den for several months. Duration of den occupancy is related to latitude, with bears at higher latitudes generally entering dens earlier and remaining denned longer (Schwartz *et al.* 2003a). In the eastern barrens of the NWT, average duration of den occupancy is 185 days (6.2 months) for males and 199 days (6.6 months) for females (McLoughlin *et al.* 2002b).

Essential elements of bear hibernation include the maintenance of survival metabolic costs through catabolism of stored fat and protein, and the lack of urination or defecation for very long periods. For pregnant females, which give birth during the denning period, costs of gestation and lactation must also be met in the absence of foraging. Weight loss in hibernating wild bears over the denning period can range considerably (Hellgren 1998). For grizzly bears of the Tuktoyaktuk Peninsula, Nagy *et al.* (1983a) observed significant increases in body weight during the active period (21-70%) and losses during winter dormancy (5-34%). In Alaska, adult females in the study of Hilderbrand *et al.* (2000) lost an average of 73 kg (32%) of body mass over winter. Most of this mass loss (56%) in the latter study was measured as being fat. Females emerging from dens with cubs or yearlings were lighter than solitary females, and had less fat and lower lean body mass, indicating the relative costs of hibernation, gestation, and lactation (Hilderbrand *et al.* 2000). Total body fat during early summer dropped to as low as 6.3% of body mass in bears of the eastern barrens of the NWT, and climbed to as high as 33.6% in autumn (Gau 1998). Preparation for denning includes hyperphagia (increased consumption), particularly of carbohydrate-rich foods such as berries (Gau *et al.* 2002). This compulsion to generate fat stores adequate to minimize muscle catabolism during hibernation drives foraging and directs much grizzly bear behaviour during late summer and autumn.

In addition to being physiologically adapted to environmental stochasticity and surviving long

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periods without food, grizzly bears exhibit behavioural adaptations that allow them to survive in a variety of environments. Of particular importance, bears are highly capable of learning. For example, bears receiving anthropogenic food rewards in response to particular behaviours tend to quickly become food-conditioned (McCullough 1982). Habituation, by contrast, is the loss of fear of humans as a result of a lack of negative reinforcement. Both processes can contribute to negative bear-human interactions (Herrero 2002). Aversive conditioning programs have been implemented throughout the NWT to take advantage of bears' ability to modify their behaviours (e.g., Government of the Northwest Territories [GNWT] 1996).

Interactions

When humans hunt big game, grizzly bears can be attracted to hunting activity, or to meat and food being stored at field camps. Sport hunters in the Mackenzie Mountains have observed that grizzly bears may be attracted to the sound of gunshots (Larter and Allaire 2015). In September 2014, a sport hunter was fatally killed by a grizzly bear while the hunter was butchering a moose carcass, north of the Canol Road (Larter and Allaire 2015). In September 2015, another sport hunter was attacked and injured by a grizzly bear, while sitting on a ridge and scoping for wildlife (Larter and Allaire 2016).

Grizzly bears are omnivores and as such their food habits dictate most of the species' interspecific interactions. Omnivory, however, is a term that does not apply equally to all grizzly bears in the NWT, as there can be substantial differences in individual access to different foods that dictates the extent to which bears may forage on vegetation or eat meat (e.g., there is little or no *Hedysarum alpinum* in the central barrens, and no migratory barren-ground caribou (*Rangifer tarandus*) in the southern Mackenzie Mountains). However, even within a relatively small area, food habits can show strong variation among grizzly bears. Edwards *et al.* (2011), for example, working in the Mackenzie River delta and using stable isotopes from samples of captured bears (claws and hair), showed that among grizzly bears in the region there can be individual specialists with trophic position varying from near complete herbivory to total carnivory.

The quality and digestibility of grizzly bear foods is well understood (reviewed in LeFranc *et al.* 1987). The occurrence of meat in the diet of grizzly bears may influence several physical and life history characteristics: across North America, population density, female body mass, and mean litter size are positively correlated with dietary meat content (Hilderbrand *et al.* 1999a). Among researchers studying northern grizzly bear populations the consensus is that meat, because it is highly digestible and high in protein, is often preferred by bears over vegetation for feeding; however, meat is not always readily available and so herbivorous diets predominate (Pearson 1972, 1975; Miller *et al.* 1982; Nagy *et al.* 1983a, b; Nagy 1990; MacHutchon 1996). In the Mackenzie Mountains for example, summer diets were as much as 86% based on the roots of *Hedysarum* (Miller *et al.* 1982).

Phillips (1987) suggested that the restricted availability of animal protein (barren-ground

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caribou) may limit the distribution of barren-ground grizzly bear populations. A similar argument was put forward by Banfield (1958), who reasoned that barren-ground grizzly bear distribution in Canada was determined by the range of Arctic ground squirrels (*Urocitellus parryii*), a staple food of barren-ground grizzly bears (Nagy *et al.* 1977; Gau 1998; Gau *et al.* 2002). Gau (1998) and Gau *et al.* (2002) present data on stable nitrogen isotope analyses that support the notion that protein from ground squirrels and caribou are essential components in the diet of barren-ground grizzly bears in the eastern barrens. Body fat reserves of grizzly bears in the eastern barrens of the NWT reach annual lows during summer (Gau 1998; Gau and Case 1999): some bears tracked by Gau (1998) were reduced to under five percent body fat during the season. The presence of ground squirrels and caribou prior to the ripening of berries in autumn is likely essential for the continued survival of grizzly bears in the region. Caribou (both calves and adults) were the most prevalent food item in their study, especially in spring, mid-summer, and autumn. In early summer, when caribou were essentially absent from the region, vegetation dominated the diet of bears (including horsetails [*Equisetum* spp.], sedges [*Carex* spp.] and species of cotton grass [*Eriophorum* spp.]).

Although there is relatively little information available on grizzly bear predation of barren-ground caribou, there is evidence to suggest that grizzly bears can be effective predators of barren-ground caribou. Gau *et al.* (2002) found that grizzly bears in the North Slave geological province have diets that can consist of 10-93% caribou, depending on the season, while Mowat and Heard (2006) observed that grizzly bears in areas of the Arctic with access to barren-ground caribou consistently showed the highest terrestrial meat consumption of any North American population. Grizzly bears may have a greater impact on newborn caribou on calving grounds (Reynolds and Garner 1987; Adams *et al.* 1995).

Additional prey for grizzly bears in the NWT may include Dall's sheep (*Ovis dalli*), moose (*Alces americanus*), and muskox (*Ovibos moschatus*) (Gunn and Miller 1982; Case and Stevenson 1991; Clarkson and Liepins 1993). Grizzly bear predation on ringed seal (*Phoca hispida*) has been documented (Clarkson and Liepins 1989; COSEWIC 2002, 2012). Ringed seals (*Pusa hispida*) may be an important resource for grizzly bears living in the Arctic Archipelago. Scavenging of whale carcasses is known from traditional knowledge (Wildlife Management Advisory Council [WMAC] (North Slope) and Aklavik Hunters and Trappers Committee [HTC] 2008).

Notwithstanding the above, it is widely acknowledged that grizzly bears should seek carbohydrate-rich foods to maximally accumulate fat reserves prior to denning. Fruit is an important diet item in all areas of grizzly bear range as it provides a superabundant source of sugar prior to denning (LeFranc *et al.* 1987). Grizzly bears of the NWT enter hyperphagia (increased food consumption) in autumn to not only gain sufficient weight to survive denning but also to store energy for use the following spring (Gau 1998; Gau *et al.* 2002; Edwards 2006). Like most interior and northern grizzly bears, they do so by dramatically increasing their consumption of berries (primarily blueberry [*Vaccinium uliginosum*], crowberry, and cranberry

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[*Vaccinium vitis-idaea*]). Bears in hyperphagia may consume an average of 20,000 kilocalories worth of food per day (Gau 1998). Just as the presence of adequate protein sources during summer may be a limiting factor for the distribution of grizzly bears in the NWT, so too may the distribution of berry-producing shrubs limit the areas in which grizzly bears can successfully survive the winter.

Grizzly bears are generally thought to have no natural predators; however, a potential limiting factor of population growth is intraspecific predation. The killing of cubs to bring females into estrus, or killing of cubs and adults for food, is not uncommon in Ursidae, including grizzly bears (reviewed in McLellan 2005). Several studies of grizzly bear demography report instances of bears killing other bears, which may limit populations near carrying capacity (see *Threats and Limiting Factors*, p. 102), including in the NWT (e.g., McLoughlin *et al.* 2003b). Grizzly bears may also influence other species in ways aside from consuming them, for example by taking the kills of other predators like wolves (*Canis lupus*) (Servheen and Knight 1993; Murphy *et al.* 1998; COSEWIC 2012). Grizzly bears will also interact directly with humans, in some cases injuring and killing people (Larter and Allaire 2016) (Herrero 2002).

Grizzly bears have been noted to kill polar bear cubs on rare occasions (Taylor pers. comm. 2012), and it has been hypothesized that grizzly bears may be more effective predators of polar bears than vice versa (Slater *et al.* 2010). Miller *et al.* (2015) recently documented interspecific competition between polar bears and grizzly bears, with evidence suggesting the social dominance of grizzly bears in such interactions. Predation aside, a more important consequence of interactions between grizzly bears and polar bears – relative to the status of grizzly bears in the NWT – are recent observations of the occurrence of wild hybrids between grizzly bears and polar bears where the species overlap. For example, a hybrid polar-grizzly bear was harvested on Banks Island in April 2006, followed by two other hybrid bears being killed in 2010 in Ulukhaktok on Victoria Island (Branigan pers. comm. 2016). Instances of hybridization should perhaps not be surprising, as the polar bear evolved from the grizzly bear perhaps as recently as 200,000-250,000 years ago (Cronin *et al.* 1991; Talbot and Shields 1996a, b). The extent to which hybridization poses a conservation risk to either grizzly bears or polar bears is unknown.

Disease and parasitism has not been noted as an important limiting factor for any grizzly bear population (COSEWIC 2012). Among bears of the NWT, little is known of parasites; however, Gau *et al.* (1999) analyzed 56 fecal samples from the northeast barrens. Parasites of the genera *Nematodirus*, gastrointestinal coccidia, and an unidentified first stage *protostrongylid* larva were reported for the first time from grizzly bear feces in North America. Parasites of the genera *Diphyllobothrium* and *Baylisascaris* also were collected. *Trichinella* spp. infections should be expected (Ryan 1981). Larter *et al.* (2016) reported a high prevalence of the parasite *Trichinella* spp. in adult grizzly bears (59%) of the Dehcho.

STATE AND TRENDS

Population

Abundance

Densities for grizzly bears have been documented for a number of different study areas in the NWT (Table 5, p. 96). Applying the most recent study-specific density estimates more broadly to the eight level II ecological regions (ecoregions) in the NWT (Northern Arctic, Southern Arctic – Tundra Plains, Southern Arctic – Tundra Shield, Tundra Cordillera, Boreal Cordillera, Taiga Cordillera, Taiga Plains, and Taiga Shield) (Ecosystem Classification Group 2007 [rev. 2009], 2008, 2010, and 2012) provides a reasonable and biologically defensible method of estimating population that takes into account the expected variability in habitat quality (i.e., food resources) across the NWT. See *Appendix A* (p. 152) for detailed methodology.

Table 5. Estimated study-specific densities of grizzly bears in the NWT; study areas either wholly or partially contained within the NWT. Density estimates are calculated using either collaring data or some form of DNA mark/recapture (M/R) data analysis.

Study Area	Source	Methodology	Density (bears/1,000 km ²)	Years of Study
Anderson-Horton rivers	Clarkson and Liepins (1994)	Collars	8.2 - 9.1	1987–1989
Brock-Hornaday rivers	Nagy and Branigan (1998)	Collars	6.0	1992–1993
Central barrens	McLoughlin (2001)	Collars	3.5	1995–1999
Ekati/Diavik mines	ERM Rescan (2014)	DNA M/R - Dect. Freq.	9.0 -11.0 ^a	2012–2013
Greater Nahanni Ecosystem	Weaver (2006)	DNA Non-systematic	17.3 ^b	2002-2005
Inuvik-Tuktoyaktuk Hwy	Boulanger <i>et al.</i> 2014	DNA M/R - SECR	11.1 ^c	2013
Kitikmeot (+Sahtú overlap)	Dumond <i>et al.</i> (2015)	DNA M/R - SECR ^d	5.0	2008-2009
Mackenzie Mountains	Miller <i>et al.</i> (1982)	Collars	11.6	1973–1977
Richardson Mountains	Nagy and Branigan (1998)	Collars	19.0	1992–1993
Tuktoyaktuk Peninsula	Nagy <i>et al.</i> (1983b)	Collars	4.0	1974–1978

^a Detection frequency only. Absolute density will likely be lower than the detection frequency; however, a density estimate for the Ekati/Diavik study area is not possible because the geographic distribution of the population that lies outside the study grid, and individual residency times, are unknown parameters.

^b Detection frequency only. “Super” population size estimates were adjusted with buffers for each gender (16.1 km for males, 8.8 km for females) to obtain a derived density estimate.

^c Preliminary results only and based on one year of data. Confidence interval was 6.7-18.4 bears/1,000 km². Note

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that the study area overlaps with the Tuktoyaktuk Peninsula study area of Nagy *et al.* (1983b) and may reflect an increased density in the area.

^d DNA mark/recapture analysis using Spatially Explicit Capture-Recapture (SECR) modeling. Other grizzly bear density estimates in Nunavut are comparable: detection frequencies of 6 bears/1,000 km² at Doris North (Rescan 2012) and 6-8 bears/1,000 km² at Sabina Back (Rescan 2013).

Using the above-noted method, a total population estimate of between 4,000-5,000 grizzly bears in the NWT was obtained. Among these animals, we can expect approximately half to be mature individuals (following McLoughlin 2001, Garshelis *et al.* 2005, and Schwartz *et al.* 2003 in COSEWIC 2012), i.e., 2,000-3,000 animals. These numbers comprise between 7.0-8.8% of the estimated North American population of grizzly bears and 14.8-18.5% of the Canadian population (Canadian estimate of 27,000 bears plus 30,000 bears in Alaska) (COSEWIC 2012).

Caution must be used when extrapolating population size from data presented in Table 5 (p. 96), as each estimate has been computed with different methods (satellite collars⁹⁰ and DNA mark-recapture⁹¹) and all are dated (some by several decades). A further confounding factor, when reviewing density estimates across the north, involves the variability in habitat quality for grizzly bears. Since the availability of food resources is believed to vary across different ecoregions, bear densities are believed to be relatively low in the Taiga Shield, moderate in the Tundra Shield, and perhaps higher in coastal areas (i.e., Tundra Plains). Given the differences in how density estimates are obtained, as well as the variability in habitat quality, some caution is required when interpreting the different results outlined in northern studies. Results that are not directly comparable will influence our ability to consider spatial and temporal differences, or broader changes or trends in the population.

Current research on density for the NWT is being conducted in the Ekati-Diavik mine areas (ERM Rescan 2014), immediately south in the Snap Lake-Gahcho Kue region (Jessen *et al.* 2014), and as part of a wildlife effects monitoring program for the construction of the Inuvik-Tuktoyaktuk Highway (Boulanger *et al.* 2014). A new study in the Mackenzie Mountains is in the planning stages (Mulders pers. comm. 2016; Larter pers. comm. 2016). These latter studies are making use of hair snagging (DNA) mark-recapture methods.

Trends and fluctuations

Scientific information to determine overall population trend is not available. Estimates of abundance of grizzly bears (all ages) in the NWT for 1991 (5,050 bears; Banci 1991) and 2002 (5,100 bears; COSEWIC 2002) included lands that are now part of Nunavut. The 2011 estimate

⁹⁰ Satellite collars provide a measure of home range size, although derived density estimates may not fully reflect the degree of overlap between individuals, tending to generate more conservative estimates.

⁹¹ Sampling for DNA mark-recapture estimates is conducted within defined study areas, although researchers have taken various approaches to address the violation of ‘population closure’ – whereby a study area is deemed “closed” and the immigration and emigration of individuals does not take place. This method typically generates higher density estimates.

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of 3,500 to 4,000 bears (COSEWIC 2012) for the NWT should not imply any reduction in population size, but rather the result of Nunavut being excised in 1999. The estimate presented in COSEWIC (2012) is not comparable to the new population estimate presented above because different methods were used to derive it.

Trend information may best be obtained from local knowledge, and from this there does not appear to be anything suggesting the NWT grizzly bear population is lower than in the recent past; rather, the population is likely stable or, in the case of the Arctic Archipelago, locally increasing. For example, the 2008 report of WMAC (North Slope) and the Aklavik HTC suggested that most interviewees said that the population had not changed very much over the past 20 years; none believed that grizzly bear numbers were too low or that the population was in any danger. Near Tuktoyaktuk, numerous complaints have recently been noted about grizzly bears becoming more common in the area, and more frequently coming into contact with humans (Inuvik Community Corporation [ICC] *et al.* 2006). COSEWIC (2012) suggests that the best available evidence (both scientific and local knowledge) points to an increasing size and distribution of barren-ground grizzly bears eastward on the Nunavut mainland and north into the Arctic Archipelago. However, the magnitude of this likely expansion is not well understood; as a proportion of the abundance of the total NWT, an increase in the numbers of grizzly bears on Victoria, Banks, or Melville islands are likely to be minor.

For the Mackenzie Mountains, Larter and Allaire (2016) report that from 1996-2013, the number of adult grizzly bears observed annually by hunters has fluctuated around a mean of 305 (range 218-402) with no discernable trend over time. Similarly, the number of cubs observed annually fluctuated around a mean of 76 (range 40-115) with no trend over time. In 2014 and 2015, >500 adults and >600 total bears were observed. The 566 adult, and 656 adult plus cubs, observed in 2015 was the most bears observed in any year since 1996 when observations were first recorded. There is a positive trend in grizzly bear observations from 1996-2015 (Larter and Allaire 2016).

McLoughlin *et al.* (2003b, c) provides data on changes in the number of bears for the central barrens of the NWT/West Kitikmeot, from 1995-1999, where the population was increasing at a finite rate of increase (λ) of 1.033 (3.3%) annually with 95% confidence intervals of 1.008-1.064 ($\lambda > 1.0$ indicates population increase; $\lambda < 1.0$ indicates population decline). Few demographic studies of grizzly bears in Canada have been framed within the context of a population viability analysis (PVA), and there is no population-wide PVA for grizzly bears of the NWT. However, PVA has been used to evaluate effects of harvesting strategies on Canadian grizzly bear population dynamics, including NWT grizzly bears in the central barrens, and to highlight how lack of precise data on vital rates precludes meaningful analyses of population viability. For example, McLoughlin (2003), Peek *et al.* (2003), and McLoughlin and Messier (2004) highlight the importance of precision in estimating initial population size on outcomes of probability of persistence for simulations involving grizzly bears, and McLoughlin *et al.* (2005) present a PVA that identifies potential risks of male-biased harvesting on future age and sex structure for a grizzly bear population (see *Threats and Limiting Factors – Human-caused mortality*, p. 102, for

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further information). McLoughlin *et al.* (2003b, c) points out that although the grizzly bear population in the central barrens appeared to be increasing at a rate of 3.3% annually, it was highly sensitive to overharvest, principally due to late age of first reproduction in barren-ground grizzly bears.

The conclusion is that there is a lack of information to determine overall trend of the grizzly bear population in the NWT, but there is no evidence of a decline over the past two generations (roughly 20-30 years, assuming a 10-15 year generation length; COSEWIC 2012). Further to there being no evidence of decline, the population is at the very least stable, with local population increases likely occurring in the Mackenzie Mountains, and increases at least in parts of the mainland ISR and most certainly in the Arctic Archipelago (although here densities remain very low).

Population dynamics

Reproductive parameters for female grizzly bears in the NWT are presented in Table 6 (p. 100) (see COSEWIC 2012 for North American rates). Annual survival can generally be distinguished based on sex and age or stage of life history. Generally, researchers assess survival rates separately for cubs-of-the-year (COYs), yearlings (age 1), subadults (ages 2-4), and adults (ages ≥ 5). Maximum age ranges between 20 and 30 years for bears in the wild, depending on habitat and exposure to human-caused mortality (McLoughlin *et al.* 2003b), although longer lifespans are common in captivity (e.g., 40 years; Weigl 2005). The general pattern is for COYs and yearlings to have lower survival than subadults and adults (COSEWIC 2012).

In the NWT, survival rates have been estimated with precision only for the central barrens (McLoughlin *et al.* 2003b). Here, the annual survival rate of adult females was estimated at 0.979 (97.9%) (95% confidence interval [CI] = 0.955-0.998), while the survival rate of adult males was 0.986 (98.6%) (95% CI = 0.942-1.0). COY survival rate was 0.737 (73.7%) (95% CI = 0.600-0.844) and the yearling survival rate was 0.683 (68.3%) (95% CI = 0.514-0.821). In the Mackenzie Mountains (1973-1977; Miller *et al.* 1982), an annual cub survival rate of 0.730 (73%) was estimated as the ratio of cubs: yearlings in the population, with subadult survival at 0.755 (75.5%) (although this estimate was suspect by the authors⁹²), and 0.872 (87.2%) and 0.868 (86.8%) for adult females and males, respectively (no error rates provided). Adult survival was considerably lower than that of the estimates of McLoughlin *et al.* (2003b) for the central barrens, possible due to heavier harvest levels.

⁹² Miller *et al.* (1982) noted that a 24.5% annual mortality rate should cause a noticeable decline in the total number of subadults. It was clear from their results however, that this age distribution was flat or possibly increasing. Further, a 24.5% annual subadult mortality rate would significantly limit adult recruitment into the population, something that wasn't reflected in the age structure of the population.

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Table 6. Estimated reproductive parameters for grizzly bear populations within and adjacent to the NWT. Rates were estimated using various methods and caution must be used in making comparisons.

Study Location	Age (yrs) ^a at first litter		Litter size ^b		Interbirth interval (yrs)		Reference
	Mean (n)	Range	Mean (n)	Range	Mean (n)	Range	
Anderson-Horton rivers area	10.8 (12)	6+	2.3 (37)	1-3	4.3 (15)	3-5	Clarkson and Liepins (1994)
Brock-Hornady rivers area		5-6	1.5 ^c				Nagy and Branigan (1998)
Kugluktuk, NU ^d	8.7 (6)	7-10	2.3 (19)	1-4	2.8 (8)	1-4	Case and Buckland (1998)
Central barrens, NT-NU ^e	8.1 (10)		2.2 (35)	1-4	2.8 (17)	1-6	McLoughlin <i>et al.</i> (2003b,c)
Mackenzie Mountains		8+	1.8 (6)		3.8 (5)		Miller <i>et al.</i> (1982)
Mackenzie Mountains			1.7 (20) ^f	1.3-2.1			Larter and Allaire (2016)
Richardson Mountains		5-6	2 ^c				Nagy and Branigan (1998)
Tuktoyaktuk Peninsula	5.9 (10)	5-8	2.3 (18)	1-3	3.3 (8)	3-4	Nagy <i>et al.</i> (1983b)

^a Ignores 'half-years', e.g., ages reported as 6.5 were considered to be 6 years old.

^b Cubs of the year.

^c No sample size indicated by report authors.

^d Includes some litters that died.

^e Case and Buckland (1998) present a subset of data from the larger study area of McLoughlin *et al.* (2003b).

^f Annual litter size estimates from observation data 1996-2015; 228 total observations (7-21/year).

Immigration and emigration rates from/to areas outside the NWT are not well known. McLoughlin *et al.* (2002c) showed considerable exchange between the North Slave region of the NWT and Nunavut. This was more evident for the male, rather than the female constituent of the population. This is expected given sex differences in dispersal and home range sizes for this region (McLoughlin 2000; McLoughlin *et al.* 1999, 2002c, 2003a; Gau *et al.* 2004). Grizzly bears are expected to have similarly high exchange with animals in the Yukon.

Possibility of rescue

Grizzly bear populations in Alaska, where >30,000 bears are estimated to live (Schwartz *et al.* 2003a) and the population is deemed secure, may provide a rescue effect for the species in northern Canada, for both the Yukon and NWT. The Yukon population size is estimated at 6,000 to 7,000 bears (the 2011 trend was considered stable; COSEWIC 2012), and shared ranges in the Mackenzie Mountains and Richardson Mountains (where densities are as high as 19 bears/1,000 km²; Nagy and Branigan 1998) allow interchange and possibility of rescue. Grizzly bears of British Columbia range into the Liard River area and southern Mackenzie Mountains, but densities in the taiga of northeast British Columbia are expected to be low. Nunavut grizzly bears

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may range into the NWT (McLoughlin *et al.* 2002c), but due to the low densities of barren-ground grizzly bears their source as a rescue population is also likely minimal.

Habitat

Habitat availability

Grizzly bear area of occupancy in the NWT is not expected to differ substantially from historical times (Figures 6-7, p. 80-81); i.e., there does not appear to be substantial areas of suitable habitat that are not occupied by the species. Use of islands of the Arctic Archipelago is likely increasing (see *Habitat requirements*, p. 39). Areas of highest density for the species include the mountainous regions of the NWT, especially the Mackenzie Mountains (11.6 bears/1,000 km²; Miller *et al.* 1982; 17.3 bears/1,000 km²; Weaver 2006) and Richardson Mountains (19 bears/1,000 km²; Nagy and Branigan 1998). These regions represent important habitat for the territorial population of grizzly bears.

Habitat fragmentation

Habitat fragmentation as a barrier to dispersal in grizzly bears is expected to be very low for the NWT. Although in other jurisdictions, like southern British Columbia, highways and other disturbances are known to significantly affect bear movements and genetic connectivity of grizzly bears (review in COSEWIC 2012), nothing has been specifically noted or expected for bears of the NWT. ENR (2015b) presents data and maps on road densities in the NWT. The average road density in the NWT, including all-season roads, is very small at 0.22 km/100 km², and largely exists outside of grizzly bear range. Where roads have been established, road density remains much less than in other areas of Canada: road density in the British Columbia portion of the Taiga Plains is 52 km/100 km², and average road density in Canada is appropriately 10 km/100 km² (ENR 2015b). ENR (2015b) also reports on trends in exploration and resource extraction activities in the NWT: the total land under mineral leased claims, typically for active mines and development activities, was approximately 8,700 km² in 2007, or about 0.7% of the NWT. Mining and exploration activities, which may be intense in localized areas (e.g., immediately around diamond mines), are not expected to represent significant barriers to dispersal for grizzly bears at the population level.

Habitat trends

Trends in habitat availability for grizzly bears in the NWT are not expected to be pronounced, given the relatively low levels of road density and development activity that currently exist for the NWT (see *Habitat fragmentation*, p. 101). Further, recent trends would suggest an increase in availability of habitat associated with new sightings of grizzly bears in the Arctic Archipelago

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(COSEWIC 2012; see also *Distribution trends*, p. 102).

Distribution trends

No contraction of grizzly bear range in the NWT has been noted. The species appears to continue to occupy the bounds of its historic range (Figures 6-7, p. 80-81) and may be expanding this range into the Arctic Archipelago (Doupé *et al.* 2007). A similar expansion of range into low Arctic tundra regions in recent years has also been noted eastward in Nunavut and into northern Manitoba (Clark 2000; McLoughlin 2001; Doupé *et al.* 2007; Rockwell *et al.* 2008). McLoughlin *et al.* (2003b) noted that the barren-ground grizzly bear population along the NWT and Nunavut border was increasing in 1999 at an annual rate of 3.3%, which, due to dispersal, may in part account for recent observations of grizzly bears in the Low Arctic habitat outside of its historic range. COSEWIC (2012) presents an accounting of local knowledge of occurrences of grizzly bears in northern NWT and eastern Nunavut (see *Traditional and Community Knowledge component – NWT Distribution*, p. 33). While many of the observations of grizzly bears outside of their historic range appear to be of male bears, no analysis has been done to examine whether the range expansion is truly male-dominated or if so, why. Further, the reasons for this northern and eastern range expansion are not known, although climate change may be playing a role (COSEWIC 2012; Reid *et al.* 2013).

THREATS AND LIMITING FACTORS

Human-caused mortality

The main threat affecting grizzly bear distribution and abundance in the NWT (and all of North America) is human-caused mortality, which has important influences on probability of area of occupancy (COSEWIC 2012). Without human interference, the density of grizzly bear populations will be determined by habitat productivity, including abundance and seasonality of food, as expressed in primary productivity or variation in primary productivity (see Ferguson and McLoughlin 2000; McLoughlin *et al.* 2000).

In the NWT, the main sources of human-caused mortality include Aboriginal subsistence harvesting, resident hunting, licensed guided hunting by non-residents, and kills in defense of life and property. A small number of bears may be killed by accident (e.g., from collisions), during the course of research, and an unreported level of kill may also exist, including illegal kills (although these numbers are expected to be very small for the NWT). Many Aboriginal groups within grizzly bear range harvest bears for subsistence.

In the ISR, all grizzly bear harvest (subsistence, defence of life and property, sport) is guided by a co-management plan (Nagy and Branigan 1998). The plan includes provisions for quotas in established community hunting areas, which are incorporated into community bylaws and regulations under the NWT's *Wildlife Act* (S.N.W.T. 2013, c. 30). The total annual quota for the

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ISR in the NWT is 62 grizzly bears, with a maximum of 20 of those being females⁹³. Grizzly bear quotas have been increased in the ISR twice since 2010, based on preliminary results of the Inuvik-Tuktoyaktuk road work, as well as local observations (WMAC (NWT) 2015). In the Gwich'in Settlement Area (GSA), a similar quota system is used, based upon a three-year total of 36 (annual quota of 12 for three consecutive years) grizzly bears for the whole region (GRRB 2002)⁹⁴. As with the ISR, the quota is male-biased (no more than 1/3 of the harvest should consist of female grizzly bears) and includes subsistence harvest, defence of life and property kills, sport hunting, and illegal kills. Unlike the quotas established in the ISR however, GSA quotas are not legally-binding.

Outside of these two regions, grizzly bear harvest in the NWT falls under the NWT *Wildlife Act* (S.N.W.T. 2013, c. 30). There is a lifetime harvest maximum of one grizzly bear per resident harvester in the Mackenzie Mountains of the NWT. All non-resident and non-resident alien harvest is restricted to the ISR, must be undertaken through an outfitter, and is subject to the ISR quotas noted above. With the exception of the ISR and GSA (discussed above), there are no limits on subsistence harvest of grizzly bears in the NWT.

Management responses to human-grizzly bear interactions may include capture and translocation rather than killing the offending bear (Schwartz *et al.* 2003a); however, non-lethal removals are often not effective and management kills of grizzly bears are generally the outcome of conflicts where they occur in the NWT. Active programs to educate the public about 'safety in bear country' and being 'bear aware', are useful (e.g., GNWT 1996, 2009); nevertheless, the kill of grizzly bears in defense of life and property remains a substantial proportion of all known human-caused mortalities throughout grizzly bear range in the NWT (~28% of the overall total: 171/614 documented human-caused mortalities since 2001; ENR unpubl. data 2016; Table 7, p.104). COSEWIC (2012) highlights research-related deaths (e.g., capture mortalities) and accidental deaths where hunters mistake grizzly bears for black bears as additional sources of mortality; however, rates are likely minor in the NWT (Table 7, p. 104). Annual regional harvest rates for the NWT, including where available, type of mortality, are presented in Table 7 (p. 104) and the data on human-caused mortalities for each region are presented in Figure 10 (p. 105).

⁹³ The ISR is divided into six grizzly bear management areas, each of which has its own quota: I/GB/01 (Aklavik-NWT) - 7 grizzly bears (2 of which can be female); I/GB/03 (Inuvik) – 12 grizzly bears (4 of which can be female); I/GB/04 (Tuktoyaktuk-West) – 16 grizzly bears (5 of which can be female); I/GB/05 (Tuktoyaktuk-East) – 8 grizzly bears (2 of which can be female); and I/GB/06 (Paulatuk) – 13 grizzly bears (4 of which can be female). The sixth area, I/GB/02 (Aklavik-Inuvik) has an annual quota of 6 split evenly between Aklavik and Inuvik (2 of which can be female) (Nagy and Branigan 1998) (Pongracz pers. comm. 2016).

⁹⁴ The GSA is divided into five grizzly bear management areas, each with its own quota: G/GB/01 (Richardson Mountains North); G/GB/02 (Richardson Mountains South); G/GB/03 (north of the Mackenzie River); G/GB/04 (south of the Mackenzie River); and G/GB/05 (Mackenzie Mountains). G/GB/01-04 all have three-year quotas of 6 grizzly bears, use of the remaining 12 tags of the three-year allocation is specified by the GRRB after consultation with the RRCs and could be used in any of the 5 management areas (ENR 2014b; GRRB 2002). Furthermore, any unused tags in the three-year allocation cycle will revert into credits that can be applied to any emergency and illegally killed bears that may occur in the next three-year cycle period.

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Table 7. Documented annual human-caused mortality rates (average animals killed per year) of grizzly bears in the NWT, since 2001 (summarized from ENR unpubl. data (2016)).

Management Region	Years ^a	Total Average	Breakdown by sex			Breakdown by type of human-caused mortality			
			Male	Female	Unknown	Hunting ^b	Problem bear	Research related	Illegal / Other
Inuvialuit Settlement Region	2001–15	25.3	18.5	6.2	0.5	22.0	3.1	0.1	0.07
Gwich'in Settlement Area	2001–15	5.9	4.3	1.1	0.6	3.1	2.7	0.0	0.1
Sahtú Settlement Area	2001–16 ^d	6.9	-	-	-	4.5	2.4 ^c	0.0	0.0
Dehcho Region	2001–16	1.7	1.2	0.5	0.0	0.4 ^e	1.3	0.0	0.1
North Slave Region	2001–15	2.4	1.3	0.3	0.7	0.0	2.4	0.0	0.0
South Slave Region	2010–15	0.0	-	-	-	-	-	-	-

^a Data are for years ending June 30, except for North Slave Region, where data are for the calendar year.

^b Hunting includes subsistence, resident and sport harvest.

^c Data are for the Mackenzie Mountains only. Data on problem bears in the Sahtú region, outside the Mackenzie Mountains, are not available except for in 2015 (5 bears) and 2016 (1 bear), therefore not included in totals.

^d No data available for Sahtú Settlement Area from 2011-2014.

^e Resident harvest from the Tungsten area of the Mackenzie Mountains, Dehcho Region, may also be included in the Sahtú resident harvest; therefore, may be counted twice.

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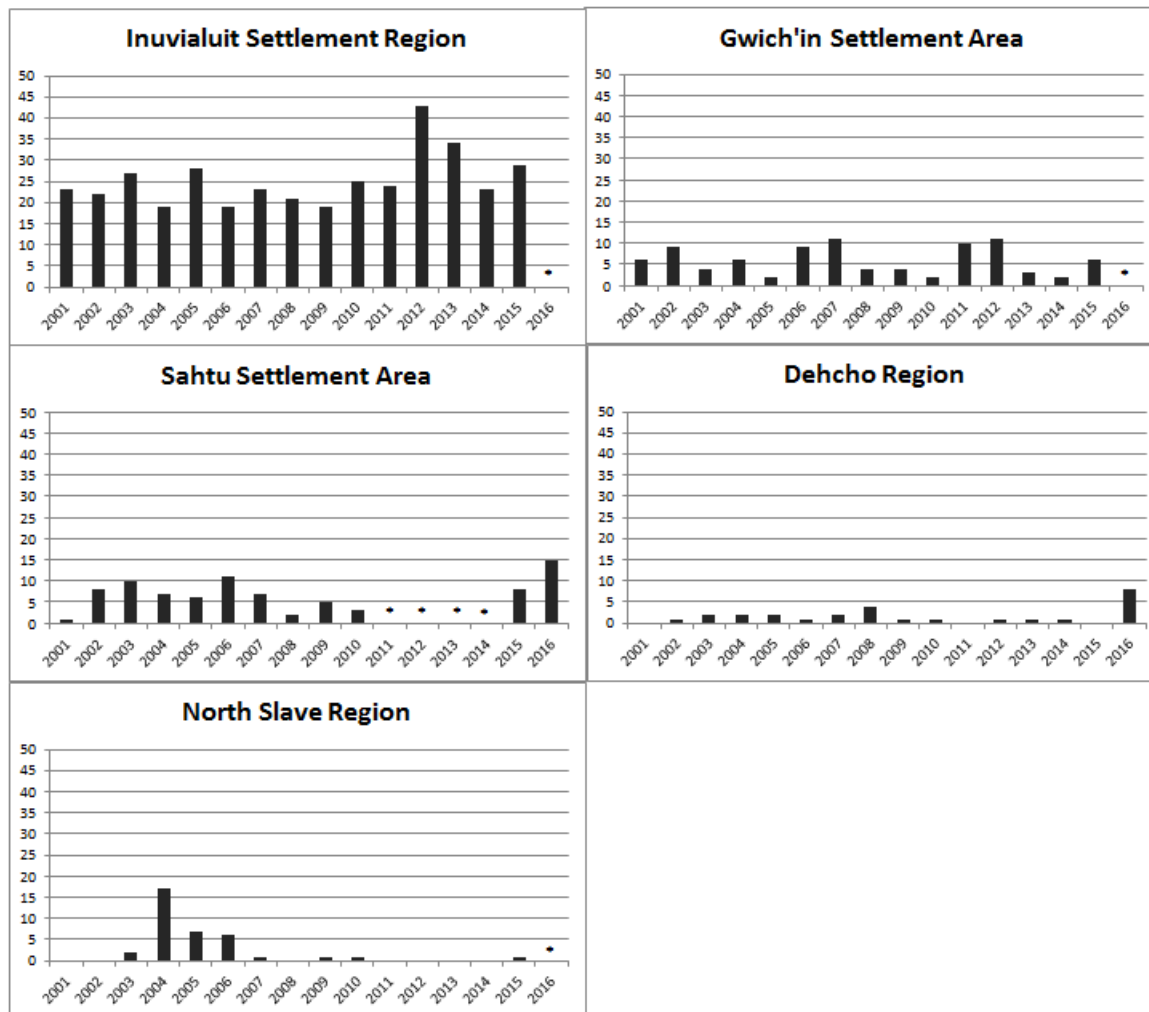


Figure 10. Documented human-caused mortalities of grizzly bears by year (ENR unpubl. data 2016). An asterisk (*) indicates data not available. For other data limitations, see the footnotes to Table 7 (p. 104).

The ISR has the greatest levels of harvest in the NWT (Table 7, p. 104). In summary, for the 15-year period 2001-2015 (data as available at time of writing, Table 7, p. 104), an average of 25.3 bears are killed per year in the ISR. Of these, the sex ratio is biased towards males (74.9% male); the majority is recorded as subsistence harvesting or guided hunts (87.1%), 12.1% as problem bears, 0.5% as research-related, and 0.3% as illegal kills. The GSA, also for the period 2001-2015 (Table 7, p. 104), reported an average of 5.9 bears killed per year: the sex ratio of the kill was 80.0% male, with a ratio of 52.8% subsistence, 44.9% problem kills, and 2.2% illegal/other kills. In the ISR and GSA, harvest is typically below the sustainable levels set out by the quotas (discussed above). The only exception is in the Aklavik-Inuvik Grizzly Bear Management Area (I/GB/02), which has an annual quota of zero grizzly bears. Between 2009-2014, 4 grizzly bears were harvested in this area, all of which were female (ENR 2014b).

For the Sahtú (12 years of data. 2001–2010 and 2015–2016, Table 7, p. 104), an average of 6.9

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bears were killed per year, with 4.8% subsistence harvest, 60.2% resident harvest, and 34.9% problem kills. Any problem kills outside the Mackenzie Mountains are not included; however, some resident harvest from the Dehcho Region may be included and therefore counted twice. For the Dehcho (16 years of data, 2001-2016, Table 7, p. 104): 1.7 bears per year killed on average, with 70.4% male, a subsistence harvest of 3.7%, resident harvest of 18.5%, kills related to problem animals of 74.1%, and other human-caused mortalities of 3.7%. From the North Slave Region (15 years of data, 2001-2015, Table 7, p. 104) grizzly bear mortalities averaged 3.5 animals/year from 2001 to 2010, but there were no mortalities reported from 2011–2015, resulting in a reduction in kill rate to 2.4 bears killed per year. All animals killed in the North Slave Region were problem kills, and were biased 80.0% male. There were no human-caused mortalities of grizzly bears reported for the South Slave Region (Table 7, p. 104). Overall, the average rate of known human-caused mortalities in the NWT is 42.2 bears per year. Unreported mortalities are not included in this number. As a total of the estimated population size of the NWT (4,000-5,000) bears, a human-caused mortality rate of less than 1.0% seems likely.

The data on human-caused mortality of grizzly bears do not indicate any clear trend over time (Figure 10, p. 105). In regions without harvest quotas (Sahtú, Dehcho and North Slave regions), human-caused mortality is generally low and variable but there can be years with higher mortality. For example, during the 2015-2016 hunting season there was an unusually high number of problem kills in the Sahtú and Dehcho regions (Figure 10, p. 105). In the ISR, grizzly bear quotas have increased twice since 2010 (WMAC (NWT) 2015).

Miller (1990: 357) showed that grizzly bear populations “under optimal conditions for reproduction, natural mortality, and with males twice as vulnerable as females” are estimated to be able to sustain a maximum annual harvest of 5.7%. Taking into account uncertainty with respect to data used to manage harvests, McLoughlin (2003) calculated 4.9% as the maximum sustainable kill (assuming 2:1 [male: female] harvest sex ratio and protection for cubs and females with offspring) in optimal habitat where bears have a low age at first reproduction and thus higher net reproductive rate (e.g., in areas where primary productivity is $>1,000$ g/m²/year; Ferguson and McLoughlin 2000). However, McLoughlin (2003) suggested 2.8% as a sustainable kill where conditions are less than ideal, and only 1.1% in low-quality habitats where primary productivity is very low, such as in the central barrens of the NWT/West Kitikmeot (where primary productivity is <600 g/m²/year; Ferguson and McLoughlin 2000). Barren-ground grizzly bears, which experience late ages of first reproduction and live at relatively low densities in highly seasonal and low-productivity environments, will be the most vulnerable to over-harvest (McLoughlin 2003; McLoughlin *et al.* 2003b,c). However, present levels of human-caused mortality even in these areas are likely sustainable in the NWT (e.g., based on a sustainable kill of 1.1% for barren-ground regions [McLoughlin 2003], 2.4 bears killed annually in the North Slave region and none in the South Slave [Table 7, p. 104], compared to a relatively large area occupied by grizzly bears in the region [$>200,000$ km²] that conservatively supports more than 500 bears). The current level of estimated human-caused mortality across all of the NWT, at or

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near 1.0% or less, is likely sustainable and not a current threat to causing NWT-wide population decline. That being said, the grizzly bears of the North Slave region move freely between this region and the Kitikmeot region of Nunavut. In the Kitikmeot region, the average annual grizzly bear harvest between 1995-2014 was 13 bears (range 22-40) (Department of Environment 2016). Combining this estimated Kitikmeot harvest with the North Slave harvest (15.4 bears/year) would result in an annual harvest closer to 3% in the central NWT/Kitikmeot area, which is higher than the 1.1% sustainable rate suggested by McLoughlin (2003) for that habitat.

The current level of harvest in the NWT is also likely to be sustainable because of the overall male-biased kill ratio that exceeds 2:1 (male: female), which, in most areas, is near or above 3:1 (Table 7, p. 104). As with many polygynous species, more male grizzly bears can usually be harvested than females without leading to overall population decline (Caughley and Sinclair 1994). Most jurisdictions that allow grizzly bear hunting (including the NWT) traditionally direct harvest toward male bears by protecting family groups (females with cubs). There may be some unanticipated changes to local population dynamics with sex-biased harvesting, as noted by traditional knowledge, however. For example, some of the interviewees in the report from WMAC (North Slope) and Aklavik HTC (2008) were concerned that the number of bears around Aklavik and in the Richardson Mountains, NWT, had decreased, and that bears in this area were smaller than people remembered them being; they suggested that when harvesters remove all the large, old males, younger and smaller bears move into the vacant territory. Wielgus and Bunnell (1995, 2000) found lower reproductive rates, mean litter size, and age at first reproduction in a hunted Canadian population compared to an un-hunted population. Males immigrating to replace hunter-killed males were considered potentially infanticidal, and resident females avoided those bears and the high-quality habitats they used; however, Miller *et al.* (2003) and McLellan (2005) found no evidence for such an effect. McLoughlin *et al.* (2005) present a PVA that identifies potential risks of male-biased harvesting on future age and sex structure for a grizzly bear population; however, the current sex ratio of human-caused mortality and rates of mortality in the NWT are not likely to lead to population decline as indicated by population viability modelling (McLoughlin *et al.* 2005).

Habitat disturbance

Threats to grizzly bears from habitat disturbance have been primarily studied in the context of mining and exploration in the central barrens near Lac de Gras and surrounding sites (e.g., Johnson *et al.* 2005), and areas of oil and gas exploration in the Mackenzie River delta (e.g., Harding and Nagy 1980; Edwards 2007). Human activities influence how bears use potential habitat, and may affect functional availability of habitat on an operational and cumulative effects basis, but also may directly affect grizzly bear numbers through mortality risks associated with bear-human conflicts (also see *Threats and limiting factors - Human-caused mortality*, p. 102). For example, Johnson *et al.* (2005) examined factors that influenced the distribution of carnivores, and concluded that mines and other major developments had the largest negative

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effect on species' occurrence, followed by exploration activities and outfitter camps. Wolves and grizzly bears had the strongest negative response to human disturbances (Johnson *et al.* 2005). Where grizzly bears are not habituated, they are known to avoid zones of human activity (McLellan and Shackleton 1988; McLellan 1990). The resulting reduction in habitat use can extend over a land area much larger than that occupied by the development itself. Foremost in importance among habitat alterations are those that convert grizzly bear habitat to areas that will not be suitable for bears either permanently or over long periods of time. For the NWT, included in this category will be resource-extraction industries and associated construction of transportation corridors.

Thus far, permanent removal of suitable habitat by human activity within grizzly bear range remains relatively small in terms of the species' overall range in the NWT and fragmentation is low (see *Habitat fragmentation*, p. 101; but also *Other risks*, p. 110). However, increased future resource development and the establishment of transportation corridors could potentially pose a significant threat to grizzly bears (COSEWIC 2012; Nielsen *et al.* 2006; Department of Transportation [DOT] 2015).

In the Mackenzie Mountains, the Canadian Zinc Corporation's Prairie Creek lead/zinc mine and Selwyn Chihong Mining Ltd.'s Selwyn Project will both be situated in grizzly bear habitat. The Prairie Creek mine builds upon existing infrastructure at the site and the associated all-season road from the Liard Highway to the mine will likewise largely be built along an existing winter road right-of-way. The Selwyn Project will include the construction of the mine, associated infrastructure, and an access road. Environmental assessments for both mines are complete (Mackenzie Valley Review Board [MVRB] 2016b and f), while the environmental assessments for both proposed access roads are still underway (MVRB 2016c and e).

Several projects are being considered in the Slave Geological Province (North Slave region of the NWT and Kitikmeot region of Nunavut). The environmental assessments for Fortune Minerals Ltd.'s NICO Project and Avalon Rare Metal Inc.'s Nechalacho Rare Earth Element Project have recently been completed (MVRB 2016a and d). These projects will proceed in the North Slave region, near Whatì and Yellowknife, respectively. Although these sites are not within the range of grizzly bears, they fall within the summer range of the Bathurst caribou herd, a key prey species for barren-ground grizzly bears. In the Kitikmeot region, MMG Resources Inc. is proposing the construction of a zinc/aluminum/lead mine at Izok and High lakes (Izok Corridor Project), an all-season access road, and a port facility at Grays Bay on the Coronation Gulf (MMG Resources Inc. 2012). Also in the Kitikmeot region, Sabina Gold and Silver Corp.'s proposed Back River Gold Mine Project was recently rejected by the Nunavut Impact Review Board, owing to the potential for adverse impacts to caribou and other terrestrial wildlife and the high degree of uncertainty associated with the proposed mitigation measures (Nunavut Impact Review Board 2016). The proposed project included the development of up to six deposits, winter roads to connect these sites, and a marine laydown area in southern Bathurst Inlet (Sabina Gold & Silver Corp. 2016). Although these last two projects have footprints entirely within

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Nunavut, the transboundary nature of the grizzly bear population in the Slave Geological Province makes potential future impacts from these projects relevant to the assessment of grizzly bears in the NWT.

In terms of transportation infrastructure, there is a 28 km all-weather haul road attached to a diamond mine in the central barrens and adjacent all-weather roads now under construction (e.g., the Jay pipe expansion at the Ekati diamond mine), and there are regular discussions in some circles of an all-weather road connecting a deep-water portion of the Arctic coast to interior resource developments. As well, the GNWT has proposed an extension of an all-weather road, Highway 4 (Tibbitt Lake), into the Slave Geological Corridor and is prioritizing the development of the Mackenzie Valley Highway from Wrigley to Tuktoyaktuk (to be completed in sections; the Inuvik to Tuktoyaktuk Highway is under construction and planning is underway to extend the Highway from Wrigley to Norman Wells) (DOT 2015).

In all these cases, direct and indirect factors may impact grizzly bears, including possible increases in human-grizzly bear conflicts, disturbance associated with project activities, and/or impacts to prey species. Grizzly bear incidents⁹⁵ at the Diavik, Ekati, Jericho, and Snap Lake mines between 1996-2009 totaled 184; more than the number of incidents associated with any other carnivore. Fortunately, only four of these incidents resulted in the grizzly bear having to be destroyed (Fortune Minerals Ltd. 2011). In terms of disturbance, it is well known that grizzly bear populations in areas of high road densities generally decline in distribution and abundance (Mattson and Merrill 2002). Regardless, grizzly bears are generally believed to have considerable plasticity in their foraging patterns, which allows for adaptation to altered environments. Mace *et al.* (1996), in a report on grizzly bear responses to traffic volume in Montana, found that avoidance tended to be triggered at traffic volumes of more than 10 vehicles/day, with most bears avoiding roads with a volume of 30 vehicles/day, and all bears avoiding roads with a volume of 60 vehicles/day. For comparison, the Canadian Zinc Corporation is anticipating 30 truck trips/day on the all-season access road for the Prairie Creek mine (Tetra Tech EBA 2015).

The impact of fire on grizzly bears or grizzly bear habitat is unclear. Grizzly bears tend to favour open habitat (see *Habitat Requirements*, p. 83, for a discussion of habitat selection) and in this context, the absence of regular fires may adversely impact grizzly bears (Hamer and Herrero 1987; Zager *et al.* 1983; Nielsen *et al.* 2004) that occur in the forested areas of the NWT. In contrast, wildfires that remove habitat for key prey species such as barren-ground caribou (see *Interactions*, p. 93) may be detrimental. In 2014 and 2015, the NWT experienced particularly severe fire seasons, with 385 fires impacting about 3.4 million hectares in 2014 (ENR 2014a) and 245 fires impacting about 650,000 hectares in 2015 (ENR 2015a). Short and long-term impacts from these fires have yet to be assessed.

⁹⁵ Defined as any interaction between a grizzly bear and the mine (e.g., use of deterrents, bear re-location, damage to property).

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Climate change

The impact of climate change on grizzly bears in the NWT is, for the most part, speculative, and identifying the influence of climate change on projected grizzly bear numbers is not possible at this time (COSEWIC 2012). COSEWIC (2012) and Reid *et al.* (2013) point out that it is likely that with climate change we can anticipate a lengthening of the growing season at higher latitudes, which may improve bear habitat in the north and allow the species to expand its range into the Arctic Archipelago. Articles in the popular press have contemplated increasing range overlap between polar bears and grizzly bears as a result of climate change leading to greater opportunities for hybridization; however, very few researchers have commented on this scenario in the peer-reviewed literature. Slater *et al.* (2010) suggests that if increased range overlap were to occur, grizzly bears may displace polar bears for morphological reasons, specifically because of weaker skull strength in polar bears despite similar bite strength in both species. Further, changes to habitat and vegetation, such as an expected increased range expansion of shrub species and concomitant declines in lichen abundance in the western Arctic tundra (Fraser *et al.* 2014), may affect community dynamics including potential changes in prey (e.g., barren-ground caribou) availability. However, very little quantitative research on climate change and its effects on grizzly bear distribution has been conducted, precluding any statement as to impacts on status at this time.

Other risks

It is hard to predict what future threats and limiting factors grizzly bears in the NWT will face. Other potential risks faced by grizzly bears due to disease, contaminants, and factors other than direct human-caused mortality (e.g., habitat disturbance) are likely minor for grizzly bears in the NWT (although such risks cannot be quantified without additional data). Further impacts on local grizzly bears may arise from declines in prey availability; for example, recent declines in migratory barren-ground caribou herds (Tuktoyaktuk Peninsula, Cape Bathurst, Bluenose-West, Bluenose-East, Bathurst, and Beverly herds in the NWT; Qamanirjuaq herd in Nunavut) (Adamczewski *et al.* 2015; Campbell 2015). The potential for this to influence grizzly bear numbers in the NWT is not yet known; however, as discussed in *Interactions* (p. 93), barren-ground caribou form a key component of the diets of barren-ground grizzly bears in the NWT. The loss of this major food source could place a significant burden on the grizzly bears of the NWT.

POSITIVE INFLUENCES

Positive influences on grizzly bear populations in the NWT (i.e., factors that are likely to promote population growth) can be classified into two main categories: 1) protections afforded grizzly bears through legislation and management planning and 2) the potential for climate change in northern parts of the species' range in the NWT to improve grizzly bear habitat. Of

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these two influences, only the former can be commented on without resorting to speculation. Thus far, it would appear that levels of human-caused mortality are sustainable (at or less than 1.0% of the total NWT population size), and several management and land-claim agreements that take into account the sustainable harvest of grizzly bears are in place.

The NWT's *Big Game Hunting Regulations* (R-008-2016, section 9.1) prohibit all hunters from hunting a grizzly bear in a den or any grizzly bear accompanied by a cub. Section 51(2) of the NWT's *Wildlife Act* further prohibits any unauthorized person from breaking into, destroying or damaging a den (S.N.W.T. 2013). All hunters who buy grizzly bear tags are asked to complete a questionnaire to report observations of grizzly bear regardless of the hunt's outcome.

Grizzly bear harvest in the ISR is co-managed by the respective governments and recommendation from the Wildlife Management Advisory Councils for the Yukon (North Slope) and NWT (Nagy and Branigan 1998), with goals to: maintain current population size by ensuring that the total number of bears removed through harvest, defense kills, and illegal hunting each year is sustainable; to allow recovery of populations in the event that over-harvest occurs by reducing quotas or closing areas for hunting; and to maintain current areas of grizzly bear habitats (Nagy and Branigan 1998). The annual total allowable harvest quota, which includes kills in defence of life and property, is established at 3% of the estimated sub-regional population of bears older than two years, and the benchmark for male-biased harvesting is two males per female harvested. In the ISR, non-beneficiaries are required to request permission to hunt grizzly bears anywhere in the region.

In the GSA, grizzly bear management is guided by a non-legally binding co-management plan (GRRB *et al.* 2000; GRRB 2002). As with the ISR, male-biased harvest quotas are used (no more than 1/3 of the harvest can consist of female grizzly bears), and the harvest of bears accompanied by cubs or in a den is prohibited. The goals of the management plan are focused on sustainable harvest management, the protection of habitat, research and knowledge sharing, and the mitigation of human impacts on grizzly bears.

In the Mackenzie Mountains, non-resident hunting of grizzly bears has been closed since 1982 and resident hunters are restricted to the harvest of one bear in their lifetime from the Mackenzie Mountains (Larter and Allaire 2016).

In the Sahtú Dene and Métis Settlement Area, the Sahtú Land Use Plan was recently approved and was effective as of August 8, 2013. The plan (Sahtú Land Use Planning Board [SLUPB] 2013) includes protections for known dens of grizzly bears during the denning period (e.g., horizontal setbacks for activity of 800 m, flight setback of 300 m).

In addition to specific protections provided to grizzly bears from legislation, land use plans, and co-management agreements, the NWT also contains several protected areas that benefit grizzly bears, including conservation areas/plans associated with land use plans and land claim agreements that offer habitat protection measures, regulation of development, and give special consideration to the impacts of creating road access. For example, the Tłı̨chǫ Agreement (ratified

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in 2005) and Land Use Plan accommodates several habitat protections measures, including strong protections for the Ezǝdzitì region south of Great Bear Lake (Tłchǝ Agreement 2005, Tłchǝ Government 2013). The Sahtú Land Use Plan (Sahtú Dene and Métis Settlement Area) includes provisions for 30,384 km² of conservation zones, 5,608 km² as established protected areas (Saoyú-ǝhdacho National Historic Site [Grizzly Bear Mountain and Scented Grass Hills]), and 21,115 km² that is being targeted for proposed conservation initiatives (SLUPB 2013). The Gwich'in Land Use Plan regulates development activities in the GSA, which helps to protect habitat for grizzly bears in areas such as the Northern Richardson Mountains (COSEWIC 2012). The Inuvialuit Community Conservation Plans also have goals of identifying and protecting important habitats (e.g., denning habitat) of grizzly bears from disruptive land uses (Community of Aklavik *et al.* 2008; Community of Inuvik *et al.* 2008; Community of Paulatuk *et al.* 2008; Community of Sachs Harbour *et al.* 2008; Community of Tuktoyaktuk *et al.* 2008; Community of Ulukhaktok *et al.* 2008). Protected areas in the NWT that create refugia from sport hunting and resource extraction also include: Tukut Nogait National Park (16,340 km²), Nahanni National Park Reserve (30,050 km²), Naats'ihch'oh National Park Reserve (4,850 km²), Aulavik National Park (12,200 km²), and the Thelon Wildlife Sanctuary (73,106 km² across both the NWT and Nunavut). Protected areas with very strong provisions offered to grizzly bears comprise more than 12% of the area of occupancy for the species (greater if excluding areas of water and sea ice). This level of protection of grizzly bear habitat ranks among the strongest afforded the species in North America.

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Status and Ranks

Region	Coarse filter (Ranks) To prioritize	Fine filter (Status) To provide advice	Legal listings (Status) To protect under species at risk legislation
Global	G4 – Apparently secure (NatureServe 2000); SX – Extirpated in 16 of 26 North American states, provinces and territories where it occurred historically (NatureServe 2011).	LC – Least concern (IUCN 2008)	
Canada	N3 – Vulnerable (NatureServe Canada 2011)	Special Concern (COSEWIC 2012)	Under consideration.
Northwest Territories	Sensitive (NWT General Status Ranking Program 2011). Anticipate 2016 update to Secure.	Special concern (SARC 2017)	To be determined
Adjacent Jurisdictions			
United States			Threatened (USFWS 1993).
Alberta	At Risk (General Status of Alberta Wild Species 2010)	Threatened (Alberta Endangered Species Conservation Committee)	Threatened (<i>Alberta Wildlife Act</i> , Wildlife Regulation Schedule 6, 2010)
British Columbia	S3 – Vulnerable/Sensitive (NatureServe and General Status)	N/A	N/A
Yukon Territory	S3 – Vulnerable/Sensitive (NatureServe and General Status)	N/A	N/A

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Appendix A – Additional Information

Regional/cultural background

Grizzly bears are found in all five administrative regions of the NWT to a greater or lesser extent (Figure 1, p.33). Major Aboriginal groups living within a region (Figure 11, p. below) and/or distinct geological features (e.g., Mackenzie Mountains and the Slave Geological Province) will be used to reference areas within this report as appropriate. It should be noted that Figure 11 shows both areas that have been settled through negotiations (e.g., Sahtú) and areas that have negotiations underway (e.g., Akaitcho).

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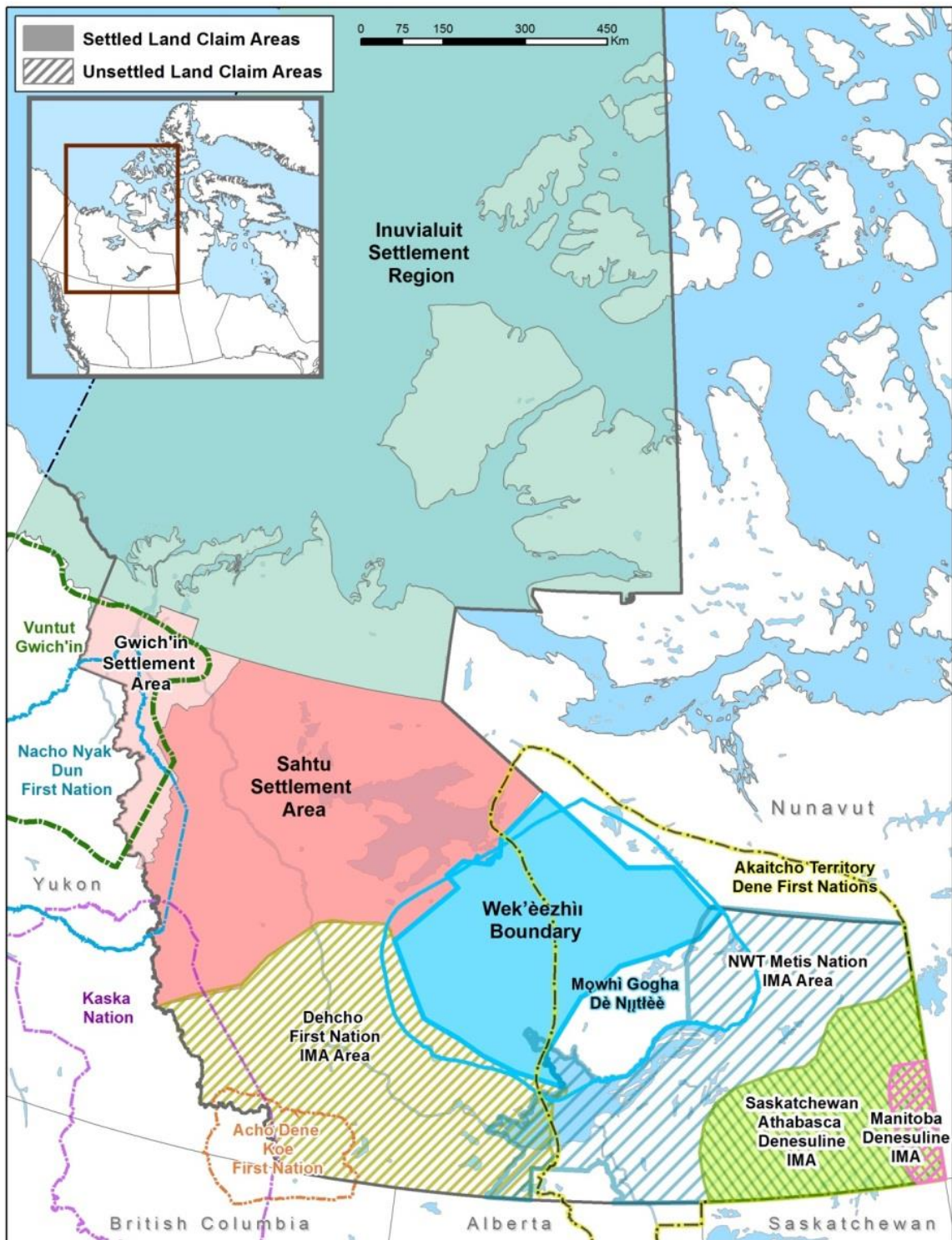


Figure 11. Settlement areas and asserted territories in the NWT. Map courtesy B. Fournier, ENR.

Status of Grizzly Bear in the NWT – Traditional and Community Knowledge

The Inuvik Region

The Inuvik region is the most northerly region in the NWT. This area encompasses the coastal regions of the Beaufort Sea and all NWT Arctic islands, as well as the Mackenzie Delta and the northern portion of the Mackenzie Mountain range (i.e., the Richardson Mountains). The Inuvik region is made up of the Inuvialuit Settlement Region (ISR) and the Gwich'in Settlement Area (GSA) (Figure 11, p. 142). Traditionally, the communities within the ISR (Aklavik, Inuvik, Paulatuk, Sachs Harbour, Tuktoyaktuk, and Ulukhaktok) speak Inuvialuktun dialects (ICC *et al.* 2006), while the communities within the GSA (Aklavik, Inuvik, Fort McPherson, and Tsiigehtchic) speak Gwich'in dialects (Gwich'in Elders 1997).

Transportation connections in this region are provided primarily by air, road (the Dempster Highway and a network of winter roads), and boat. Inuvik is the most connected community, with regular flights and the Dempster Highway providing an all-weather link to the Yukon (Industry, Tourism and Investment [ITI] 2015). A new all-weather road from Inuvik to Tuktoyaktuk is currently under construction, which will have meaningful implications for the residents of these two communities. Traditional economy does play a part in the economy of the Inuvik region, including hunting, trapping, and additional revenue from an increasing amount of tourism (i.e., arts and crafts and big game hunting) (ITI 2015).

The Sahtú

The Sahtú region can be accessed by boat and plane in the summer, and by plane and the winter road in the winter. This area is largely supported by oil production, with trapping and arts and crafts also playing a role in the regional economy (ITI 2015). Many people continue to live a traditional lifestyle, if only in a part time capacity.

The Sahtú region is completely taken up by the Sahtú Settlement Area (Figure 11, p. 142), with the Dene and Métis people of the area represented by the Sahtú Secretariat (Department of Aboriginal Affairs and Intergovernmental Relations [DAAIR] 2008). The word 'Dene' means 'the people' and is a reference to the Aboriginal people of the NWT belonging to the Athapaskan language group (Dene Nation 2014). This language group encompasses many dialects found in all of the administrative regions of the NWT (Dene Nation 2014), including the North Slavey dialect spoken in the Sahtú (DAAIR 2008). Great Bear Lake is the source of the word 'sahtú' (Sahtú Secretariat Incorporated [SSI] 2015).

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The Dehcho

The Dehcho region includes six communities (Figure 1, p. 33), and a diverse geography and economy (ITI 2015). The Dehcho First Nations Interim Measures Agreement (IMA) Area (Figure 11, p. 142) is found within both the Dehcho and South Slave administrative regions, with the Dehcho First Nations representing communities found within this area (DAAIR 2008). The Aboriginal peoples of the Dehcho region speak different dialects of South Slavey, Chipewyan, and Michif (DAAIR 2008). The Acho Dene Koe First Nation is centered in Fort Liard in the Dehcho administrative region but is not part of the Dehcho First Nations (DAAIR 2008).

This region is supported by tourism, forestry, and the traditional economy (i.e., trapping and handicrafts) and stands to benefit from mining and oil and gas development (ITI 2015) and Mackenzie Valley infrastructure projects.

The North Slave Region

The North Slave region encompasses the Tłı̨chǫ communities of Gamèti, Wekweèti, Whati, and Behchokò, and partially overlaps with the area known as Wek'èezhì (as defined in the Tłı̨chǫ Agreement) as well as Mǫwhì Gogha Dè Nı̨łtèè, which is the traditional area of the Tłı̨chǫ (as described by Chief Mǫwhì during the signing of Treaty 11). The North Slave region also encompasses the Akaitcho communities of Ndilo, Dettah, and Łutsel K'e, as well as Yellowknife, the capital of the NWT (Figure 11, p. 142). Dogrib (Tłı̨chǫ) is spoken in the Tłı̨chǫ communities (DAAIR 2008), while Chipewyan and Tłı̨chǫ are traditionally spoken by Aboriginal peoples in the remaining North Slave communities (DAAIR 2008). The Łutsel K'e Dene First Nation refer to themselves as Denesuline (Łutsel K'e Dene First Nation [LKDFN] 2001).

The Tłı̨chǫ communities, apart from Behchokò, are relatively small, remote, and isolated, with community members living aspects of a traditional lifestyle (at least in a part time capacity). Gamèti, Wekweèti, and Whati are fly-in only communities in the summer, and accessible by ice road in the winter. A proposal for an all season road near Whati is currently undergoing an environmental assessment (Mackenzie Valley Environmental Impact Review Board [MVEIRB] 2016). Ndilo and Dettah have road access while Łutsel K'e is fly-in only or accessible by Great Slave Lake by boat or snowmobile. While many North Slave residents work for the mining sector (either directly or through Aboriginal-owned companies), the traditional economy remains strong, with high participation rates in hunting and harvesting (ITI 2015).

The South Slave Region

The South Slave region includes six communities located south of Great Slave Lake (Figure 11, p. 142). The Aboriginal peoples of Fort Providence and Kakisa are part of the Dehcho First Nations. The Deninu K'ue First Nation, of Fort Resolution, are part of the Akaitcho Territory Government. Métis councils in Hay River, Fort Resolution, and Fort Smith are part of the

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Northwest Territory Métis Nation. The South Slave region also includes the Salt River First Nation and the Hay River Reserve (Kátl’odeeche First Nation). Smith’s Landing First Nation, located in Alberta, has an administrative centre in Fort Smith (DAAIR 2008). South Slavey is traditionally spoken in the Dehcho communities and Hay River, while Chipewyan is spoken in Fort Resolution, and Chipewyan, Cree, and Michif are traditionally spoken in Fort Smith (DAAIR 2008).

Communities in the South Slave region have well-developed transportation connections to both the south and the NWT capital of Yellowknife (ITI 2015). The South Slave region has a diverse economy in which the traditional economy, in the form of commercial fishing, trapping, and arts and crafts, continues to play a part (ITI 2015).

NWT Distribution

Inuvialuit Settlement Region

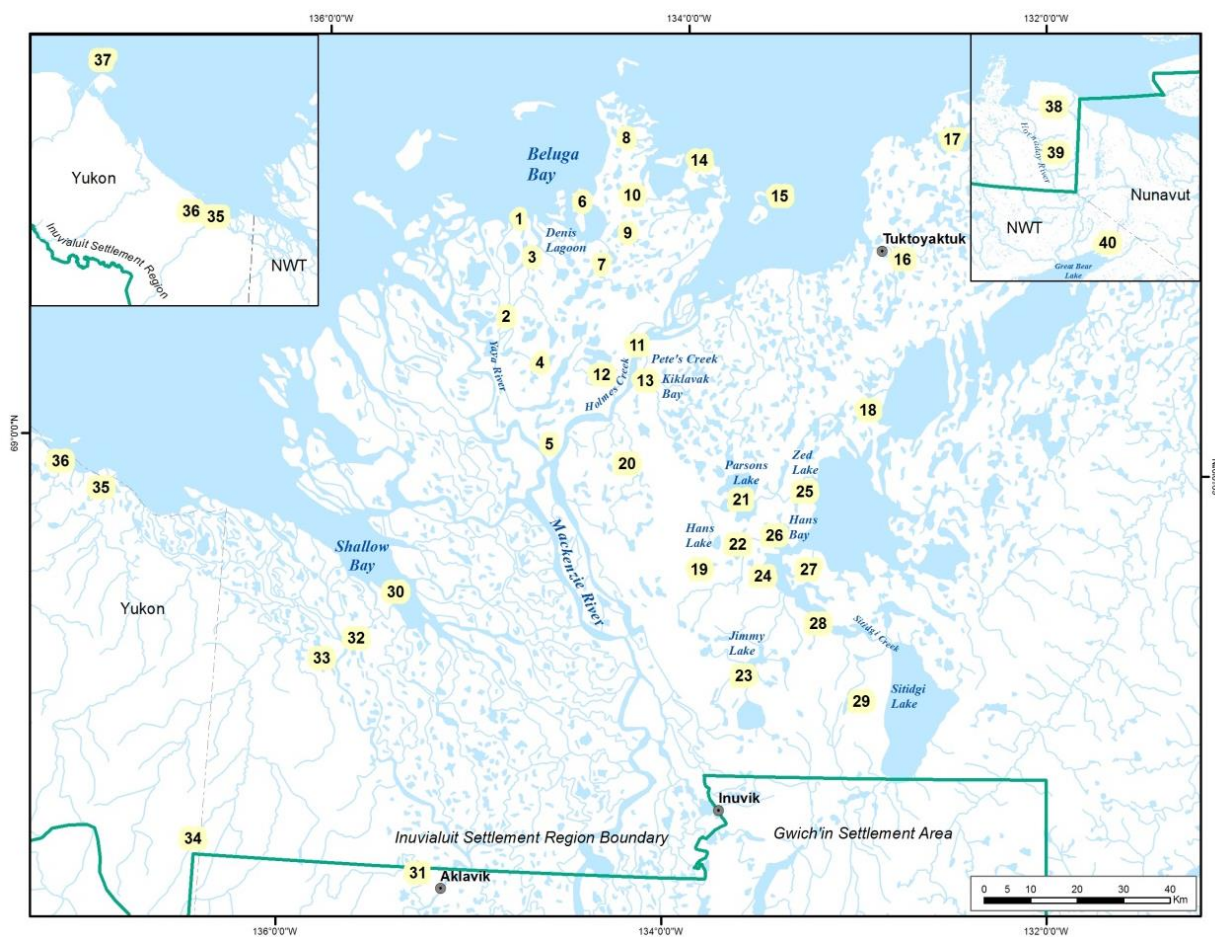


Figure 12. Western ISR place names where grizzly bear observations have been recorded by knowledge holders. The accompanying table (Table 8, p. 146) gives place names corresponding to the numbers in the figure, additional observations about the locations, as well as observation sources. Some place names reflect specific locations whereas others are large areas. Map courtesy B. Fournier, ENR.

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Table 8. Place names and additional observation details regarding the western ISR locations where grizzly bears have been observed by knowledge holders in Figure 12, p. 145. Coded sources (i.e., INU100) given are from ICC *et al.* 2006.

Number in Figure 12	Place name	Observations	Source(s)
1	Coast of Beluga Bay	Area particularly known for denning	ICC <i>et al.</i> 2006
2	Around Camp Farewell	Area particularly known for denning	INU110
3	Dennis Lagoun	Grizzly bears hunted in this area	T018, T005
4	Yaya Lakes area	Grizzly bears hunted in this area	T028
5	Richardson Island, in particular Swimming Point	Grizzly bears hunted in the autumn here	INU144, T044
6	South of West Point	Grizzly bears hunted in this area	T018, T005
7	Richards Island	Area particularly known for denning	RWED 2003; Aklavik and Inuvik verification sessions, April/May 2006 in ICC <i>et al.</i> 2006
8	North Point	Grizzly bears seen in this area	T030, T019, T031
9	North end of Swan Creek (Richards Island)	Grizzly bears known to frequent this area in the summertime	INU105, T053, T025, INU105
10	North Point, south part of Kuukpak ⁹⁶	Grizzly bears hunted in the summer and autumn by boat	T056
11	Lousy Point	Grizzly bears seen in this area	T030, T019, T031
12	Near Holmes Creek and towards Pete's Creek	Grizzly bears seen in this area in the summer/autumn	Gwich'in Elders 1997, ICC <i>et al.</i> 2006
13	Kiklavak Bay	Grizzly bears hunted in this area	ICC <i>et al.</i> 2006
14	North part of Summer Island	Grizzly bears hunted in this area in the winter and spring	INU144, INU126, T056
15	Hendrickson Island	Grizzly bears hunted in this area	INU144, INU126
16	Near Tuktoyaktuk	Grizzly bears hunted in this area	T018, T005
17	Qikuryuaq	Grizzly bears seen and hunted in this area	T011, T014
18	South of Iqalusaaq	Grizzly bears seen and hunted in this area	T011, T014
19	Storm Hills	Known to have many bears	INU101
20	Aglisuktuq Pingo	Grizzly bears hunted in the springtime	T020
21	Parsons Lake	Grizzly bears hunted in this area; area particularly known for denning	T064, T053, T025, INU105
22	East of Hans Lake	Grizzly bears hunted in the springtime	T020
23	Jimmy Lake	Known to have many bears	INU101
24	Southeast of Hans Lake	Grizzly bears seen and hunted in this area	T011, T014
25	Zed Lake	Grizzly bears hunted in this area	T031
26	Hans Bay	Grizzly bears seen in this area	ICC <i>et al.</i> 2006
27	Near Bonnieville Point	Grizzly bears hunted in this area	T018
28	By Whale Point to edge of Sitidgi Creek	Grizzly bears hunted in this area	T018
29	West of Sitidgi Lake	Area particularly known for denning	INU110
30	Shallow Bay area	Grizzly bears hunted in this area	INU144, INU126
31	Around Aklavik	Bears have been harvested from around this community	ICC <i>et al.</i> 2006
32	Sleepy Mountain	Area particularly known for denning	Aklavik and Inuvik

⁹⁶ “In the summer and fall, they are hunted by boat, below Skip Point across the Mackenzie” (T167) and “from North Point south part of Kuukpak by summer” (T056) (ICC *et al.* 2006: 11-40).

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			verification sessions, April/May 2006 in ICC <i>et al.</i> 2006
33	Strokes Point	Area particularly known for denning	Aklavik and Inuvik verification sessions, April/May 2006 in ICC <i>et al.</i> 2006
34	Fish Hole	Area particularly known for denning	Aklavik and Inuvik verification sessions, April/May 2006 in ICC <i>et al.</i> 2006
35	Inland from Shingle Point	Grizzly bears hunted in this area, area particularly known for denning	ICC <i>et al.</i> 2006
36	Running River	Grizzly bears hunted in this area	INU126
37	Hershel Island	Grizzly bears hunted in this area	ICC <i>et al.</i> 2006
38	Melville Hills	Barren-ground grizzly bears hunted in this area ⁹⁷	Milton MR Freeman 1976
39	West toward Hornaday River	Barren-ground grizzly bears hunted in this area ⁹⁸	Milton MR Freeman 1976
40	Near Great Bear Lake (not specific)	Grizzly bears hunted in this area ⁹⁹	Milton MR Freeman 1976

⁹⁷ This observation was noted to have occurred between 1916-1955 by knowledge holders.

⁹⁸ This observation was noted to have occurred between 1916-1955 by knowledge holders.

⁹⁹ This observation was noted to have occurred between 1916-1955 by knowledge holders.

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Gwich'in Settlement Area

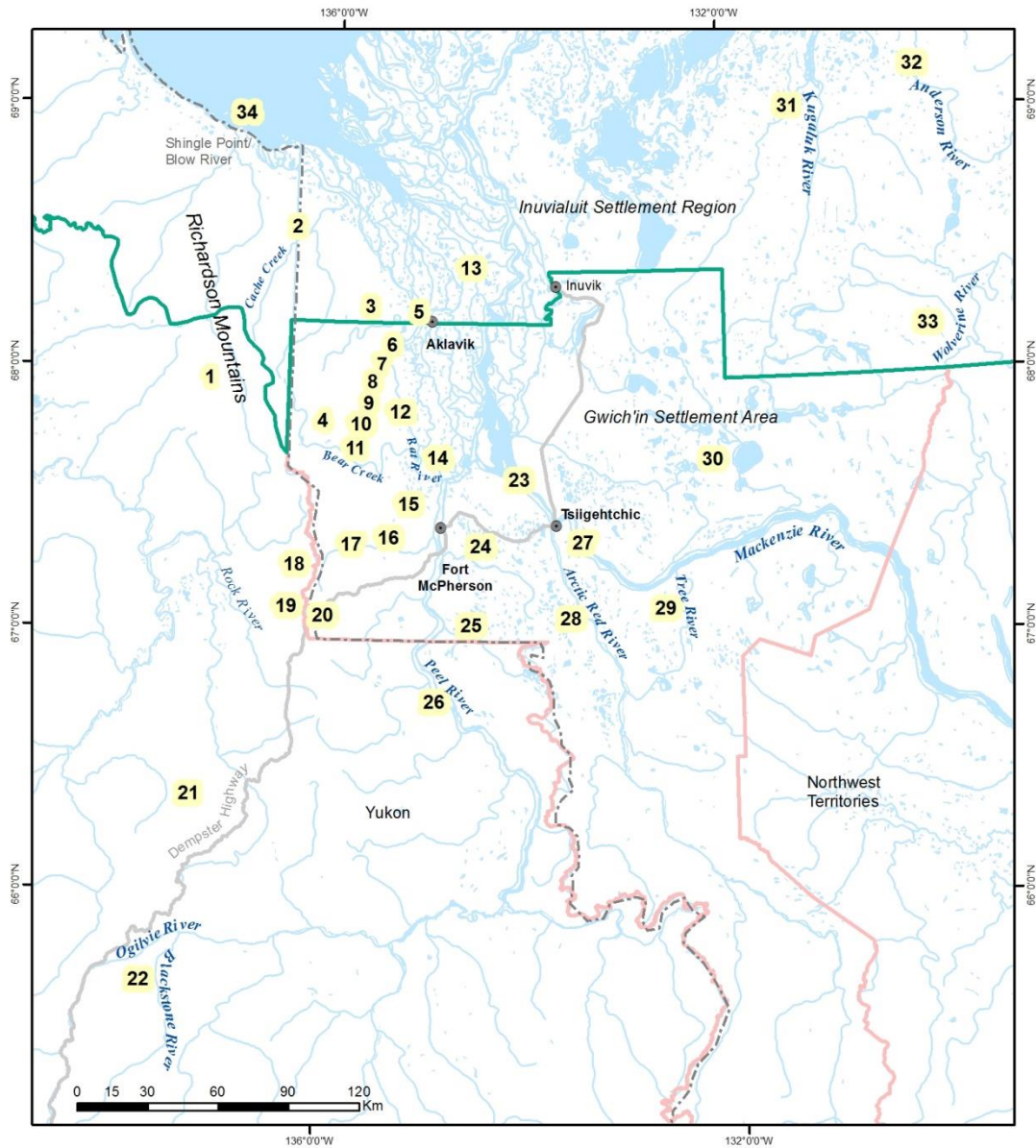


Figure 13. Locations of recorded grizzly bear observations by Gwich'in knowledge holders. The accompanying table (Table 9, p. 149) provides details and source information sequentially by number. Some place names reflect specific locations whereas others are large areas. Map courtesy B. Fournier, ENR.

Status of Grizzly Bear in the NWT – Traditional and Community Knowledge

Table 9. Place names and additional observation details noted by Gwich'in knowledge holders for locations where grizzly bears have been observed in Figure 13, p.148.

Number in Figure 13	Place name	Observations	Source
1	Richardson Mountains	Grizzly bears are seen all over this area	Bullock 1987; GSCI and GRRB 2014; John Carmichael, DSGBW 2006-11 and Eddie Greenland, Eddy McLeod, Walter Alexie <i>all in</i> GSCI and GRRB 2014; Lambert-Koizumi 2012
2	Cache Creek	Grizzly bears seen in this area	Lambert-Koizumi 2012
3	Black Mountain north to the coast	Grizzly bears seen in this area	GSCI and GRRB 2014
4	Fish Creek	Grizzly bears seen in this area	Lambert-Koizumi 2012; Eddie Greenland <i>in</i> GSCI and GRRB 2014
5	Around Aklavik	Grizzly bears seen in this area	Lambert-Koizumi 2012; Ryan McLeod, DSGBW 2006-11 <i>in</i> GSCI and GRRB 2014
6	Willow River	Grizzly bears seen in this area	Lambert-Koizumi 2012
7	Big Eddy	Grizzly bears seen in this area	Lambert-Koizumi 2012
8	Black Mountain	Grizzly bears seen in this area	Dale Semple and Abe Stewart Sr. <i>in</i> Lambert-Koizumi 2012
9	Mount Lang	Grizzly bears seen in this area	Lambert-Koizumi 2012
10	Timber Creek	Grizzly bears seen in this area	Lambert-Koizumi 2012
11	Bear Creek	Grizzly bears seen in this area	Lambert-Koizumi 2012
12	Black Mountain to the Rat River watershed (including Sheep Creek and Big Eddy)	Grizzly bears often encountered	GSCI and GRRB 2014
13	Mackenzie Delta	Grizzly bears are seen all over this area	GSCI and GRRB 2014; John Carmichael, DSGBW 2006-11 and Eddie Greenland, Eddy McLeod, and Walter Alexie <i>all in</i> GSCI and GRRB 2014
14	Rat River	Grizzly bears seen in this area	Haszard and Shaw 2000; Lambert-Koizumi 2012

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15	Black Mountain south to the Dempster Highway	Grizzly bears often encountered	GSCI and GRRB 2014
16	Stony Creek	Grizzly bears hunted in this area	Gwich'in Elders 1997
17	Brass House	Grizzly bears hunted in this area	Gwich'in Elders 1997
18	Rat River south to the Rock River area	Grizzly bears seen in this area	GSCI and GRRB 2014
19	Dempster Highway in the Southern Richardson Mountains	Grizzly bears seen in this area	Lambert-Koizumi 2012
20	Dempster Highway on the NWT-Yukon border	Grizzly bears seen in this area	Lambert-Koizumi 2012
21	Rock River area all the way to Ogilvie River	Grizzly bears seen in this area	GSCI and GRRB 2014
22	Blackstone River	Grizzly bears hunted in this area	Gwich'in Elders 1997
23	Point Separation in the Mackenzie Delta	This location noted specifically for observations of female bears with cubs	Eddy McLeod and Ernest Vittrekwa <i>in</i> GSCI and GRRB 2014
24	Area between Fort McPherson and Tsiigehtchic	Grizzly bears seen in this area	Eddy McLeod, and Ernest Vittrekwa <i>in</i> GSCI and GRRB 2014
25	Satah Creek	Grizzly bears hunted in this area	Gwich'in Elders 1997
26	Peel River	Grizzly bears hunted in this area	Gwich'in Elders 1997
27	Up the Mackenzie River from Tsiigehtchic	Grizzly bears seen in this area	Gabe Andre, GEKP 1996-97 <i>in</i> GSCI and GRRB 2014
28	Arctic Red River	Grizzly bears seen in this area; grizzly bears hunted in this area	GSCI and GRRB 2014; Gwich'in Elders 1997

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29	Tree River	Four grizzly bears noted to have been killed in this area	Gabe Andre, GEKP 1996-97 <i>in</i> GSCI and GRRB 2014
30	Travaillant Lake watershed	Grizzly bears seen in this area	George Niditchie and William Modeste <i>in</i> GSCI and GRRB 2014
31	Kugaluk River	Grizzly bears seen at camps in this area in the spring and in the fall (potentially emerging from and re-entering dens); area where grizzly bears are seen	George Niditchie <i>in</i> GSCI and GRRB 2014
32	Anderson River	Grizzly bears seen in this area; grizzly bears hunted in this area	GSCI and GRRB 2014; Gwich'in Elders 1997
33	Wolverine River	Grizzly bears seen in this area	GSCI and GRRB 2014; William Modeste <i>in</i> Gwich'in Elders 1997
34	Shingle Point and Blow River area	Four grizzly bears spotted before freeze-up (2011)	GSCI and GRRB 2014

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Abundance

Population abundance (p. 96) was estimated by multiplying the most recent study-specific density estimates by the size of the ecoregion in which the study was undertaken (Boreal Cordillera, Southern Arctic – Tundra Plains, Southern Arctic – Tundra Shield, Taiga Cordillera, and Tundra Cordillera) (see Fig. 14, below). Only the portion of the ecoregion that overlaps with grizzly bear range was considered (Fig. 7, p. 81). For those ecoregions in which no studies have been undertaken or where the reported density estimate was not deemed representative of the likely density in the ecoregion (Northern Arctic, Taiga Plains, and Taiga Shield), density estimates of 0.25, 1.0, and 2.0 bears/1,000km², respectively, were provided by Mulders (pers. comm. 2016).

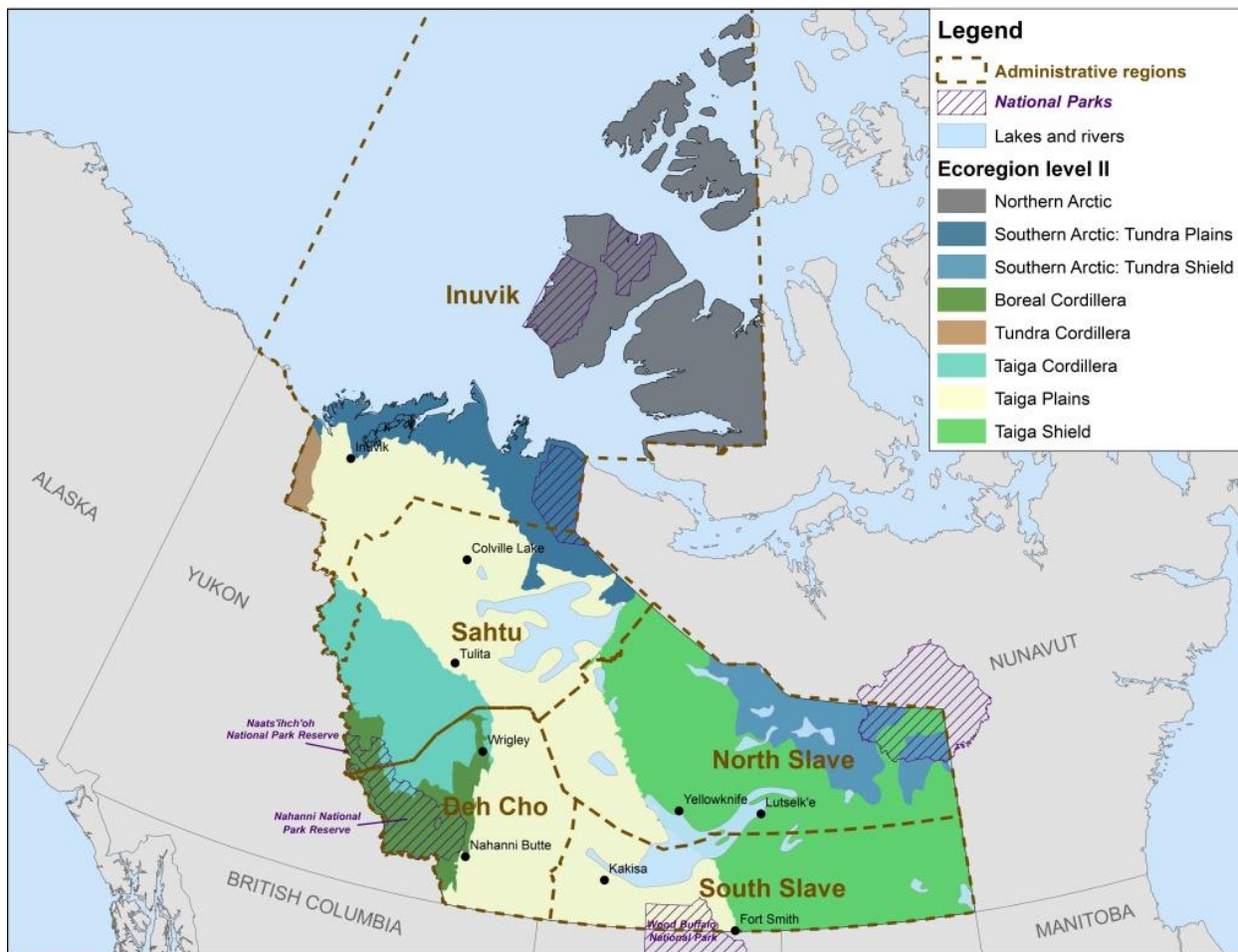


Figure 14. NWT ecoregions, administrative regions and place names mentioned throughout this report. Map was produced by J. Reimer (AKNHP) with data provided by ENR. Ecoregion delineations are from Ecosystem Classification Group (2007 [rev. 2009], 2008, 2010, and 2012).

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Table 10. Estimated grizzly bear population size by ecoregion (Ecosystem Classification Group 2007 [rev. 2009], 2008, 2010, and 2012) in the NWT (see Table 5, p. 96, for notes on density information).

Ecoregion Level II	Area of ecoregion in grizzly bear range (km ²)	Est. Bear Density (bears/1,000 km ²)	Reference	Pop. Est.(# of bears)
Boreal Cordillera	55,798	17.3	Weaver 2006	965
Northern Arctic	121,743	0.25	Mulders pers. comm. 2016	30
Southern Arctic: Tundra Plains	90,576	11.0	Boullanger <i>et al.</i> 2014	996
Southern Arctic: Tundra Shield	65,959	8.0	ERM Rescan 2014 ^a	528
Taiga Cordillera	97,230	11.6	Miller <i>et al.</i> 1982	1,128
Taiga Plains	224,243	1.0	Mulders pers. comm. 2016	224
Taiga Shield	157,550	2.0	Mulders pers. comm. 2016	315
Tundra Cordillera	8,024	19.0	Nagy and Branigan 1998	152
Calculated Total			4,339	
Population Estimate			4,000-5,000	

^a As ERM Rescan (2014) did not use Spatially Explicit Capture-Recapture (SECR) modeling analysis, which could have resulted in an artificially high density estimate, density estimate was arbitrarily reduced by 20% to 8.0 from 9.0-11.0.