

# Ensuring a future for Canada's grizzly bears

A report on the sustainability  
of the trophy hunt in B.C.

By Jeff Gailus, Faisal Moola  
and Michelle Connolly



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British Columbia may be home to as many as half of Canada's remaining grizzly bears – and the last best hope to maintain healthy populations south of the 60<sup>th</sup> parallel.

PAUL HEPPNER PHOTO



# Introduction

BRITISH COLUMBIA IS CANADA'S BIOLOGICALLY RICHEST PROVINCE. MORE THAN 50,000<sup>1</sup> plants, animals, and other organisms call B.C. home. Some of these, such as mountain goat and mountain caribou, live mostly – or only – in the province. Most remarkably, unlike most places in North America, B.C. still has all of the charismatic megafauna that were present at the time of European settlement, including grizzly bears, wolves, and wolverines. Indeed, B.C. is now one of the last safe havens for most of the large animals left on the continent.<sup>2</sup> Grizzly bears still roam, feed, and breed in much of the province, whereas in California, they are only found as an image on the state's flag, having long been eliminated from the wild.

British Columbia may be home to as many as half of Canada's remaining grizzly bears – and the last best hope to maintain healthy populations south of the 60<sup>th</sup> parallel.

Scientists believe that grizzly bears are an essential part of healthy, fully functioning ecosystems in western North America. Known as a “keystone” species, grizzlies are “ecosystem engineers” that help to regulate prey species and disperse the seeds of many plant species such as blueberry and buffaloberry. They also help to maintain plant and forest health, both by aerating the soil as they dig for roots and pine nuts and ground squirrels, and by moving thousands of kilograms of spawning salmon carcasses into the forest, where trees and other plants absorb their high levels of nitrogen.<sup>3</sup>

“Grizzly bears are indicators of sustainable development,” says Dr. Stephen Herrero, who headed Alberta's Eastern Slopes Grizzly Bear Project, one of the largest grizzly bear research projects in North America. “Where viable populations of grizzly bears persist, the landscape is being managed sustainably.”<sup>4</sup>

Unfortunately, grizzly bears face the same threats in B.C. as they face everywhere they live: habitat loss, damage, and fragmentation; the cascading effects of salmon collapse and climate change; and human-caused mortalities as a result of sport hunting, poaching, collisions with trains and vehicles, and the inevitable (and often fatal) conflicts grizzlies must endure because of careless human behaviour.<sup>5</sup> Grizzlies have already been eliminated or are currently threatened in about 18 per cent of the province, not including the Lower Mainland and most of the Interior.

“Grizzly bears are indicators of sustainable development, where viable populations of grizzly bears persist, the landscape is being managed sustainably.”  
— Dr. Stephen Herrero

Exactly how many grizzly bears live in B.C. has long been a controversial issue. The 1979 Preliminary Grizzly Bear Management Plan for British Columbia pegged the grizzly population at 6,600, a number that was used into the mid-1980s.<sup>6</sup> The government's most recent official population estimate, updated in 2008, suggests that more than 16,014 grizzly bears live in British Columbia, down from 16,887 in 2004.<sup>7</sup>

However, many independent biologists argue that B.C.'s habitat-based density estimates may not be reliable enough to adequately estimate grizzly bear populations.<sup>8</sup> There is ample evidence to suggest this is true. For example, recent local population inventories in some parts of the province have found that grizzly bear numbers are far lower – sometimes by as much as 100 per cent – than the government's initial estimates.<sup>9</sup>

The solution to reversing this continuing pattern of alienation and extirpation is two-fold: reducing human-caused mortality and protecting the habitat that grizzly bears need to survive.

One thing is certain: far fewer grizzly bears live in British Columbia today than even 100 years ago. Grizzly bears once roamed most of North America, from Alaska to Mexico and as far east as Ontario and the American Midwest. Approximately 35,000 grizzlies once roamed British Columbia's coasts, mountains, and grasslands<sup>10</sup>, but the activities that extirpated them from much of the rest of the continent over the last century – hunting, road-building, and unsustainable levels of forestry, mining, and oil and gas development, and conversion of once-prime grizzly bear habitat into agricultural production and towns and cities – continue to threaten grizzly bears in British Columbia.<sup>11</sup>

Today, the B.C. Wildlife Branch has divided the province into 57 grizzly bear population units (GBPUs) that cover 90 per cent of the grizzly's historic range in British Columbia (Map 1, on pg. 10).<sup>12</sup> Grizzly bears have already been eliminated from large portions of the Lower Mainland, the Peace River area around Fort St. John, and parts of the Cariboo and Thompson-Okanagan regions in the south-central part of the province. In addition, nine grizzly bear population units covering nine per cent of the province are so small they are now listed as "threatened" by the B.C. government and are at risk of disappearing as well.

Scientists predict that the current rate of grizzly bear habitat degradation – from expanding human settlements, road-building, recreation, forestry, and other industrial developments – could result in grizzly bears being threatened or critically endangered in close to half of their current range in B.C. by 2065.<sup>13</sup> By that time many local populations will be beyond hope of recovery and will likely be eliminated altogether.

Human-caused mortality is also a significant problem in B.C. Between 1977 and 2009, almost 11,000 grizzly bears were killed by humans, 87 per cent of which were legally killed by hunters.<sup>14</sup>

The solution to reversing this continuing pattern of alienation and extirpation is two-fold: reducing human-caused mortality and protecting the habitat that grizzly bears need to survive.



# Grizzly bear management in B.C.

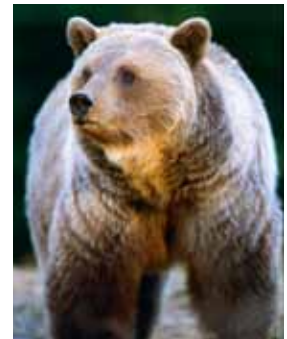
THERE WAS A TIME, NOT TOO LONG AGO, WHEN A GRIZZLY BEAR'S BIGGEST CHALLENGE IN B.C. was to figure out how to find adequate food, shelter, and mates while avoiding the odd large male or gun-toting trapper. Those were simpler days, by far, for the grizzly.

Today, grizzly bears must also negotiate a complicated network of laws and policies – rules – that determine where (and if) they can even survive.

British Columbia's grizzly bears are part of Canada's "northwest grizzly bear population," which is listed as a "species of special concern" by the national Committee on the Status of Endangered Wildlife in Canada (COSEWIC). At the provincial level, the Conservation Data Centre (CDC) has placed grizzly bears in B.C. on the "blue list." This means they are considered to be of "special concern (formerly vulnerable) in British Columbia" because their biological characteristics – a slow reproductive rate in particular – make them "particularly sensitive to human activities or natural events."<sup>15</sup>

Grizzlies face a perfect storm of threats in B.C., including habitat loss and fragmentation, climate change, and the continued decline of salmon, which is a primary food source for bears. These threats are all managed by numerous government ministries in B.C. While the Fish and Wildlife Branch oversees the management of the grizzly bear population, it doesn't have the only say on what happens to grizzly bear habitat and food sources, which are by far the most critical factors concerning the grizzly bear's future in B.C.

For instance, the Ministry of Forests and Range determines how much of B.C.'s forests are cut (and how many kilometres of roads will be built to get the logs out) and how many cattle and other livestock are grazed in grizzly bear habitat, both of which have a significant impact on the health of B.C.'s grizzly bear populations. The construction of dams and mines and oil and gas wells (overseen by the Ministry of Energy, Mines, and Petroleum Resources) and tourism infrastructure (which involves the Ministry of Tourism and, in the case of parks, the Ministry of Environment) also affect B.C.'s grizzly bears.



PAUL HEPPNER PHOTO

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The federal Department of Fisheries and Oceans (DFO) manages commercial and sport harvest of wild salmon, which have declined 30 to 90 per cent in B.C. over the last 100 years.<sup>16</sup> As a result, grizzly bears that depend on salmon-spawning habitats often have greatly reduced food resources in some years, which can negatively affect reproductive and population persistence rates. All of these activities add up to less effective habitat and more risk for B.C.'s grizzly bears.<sup>17</sup>

Rightfully concerned about the future of its grizzly bear population, the B.C. government completed the British Columbia *Grizzly Bear Conservation Strategy*. Published in 1995, this strategy provides a blueprint for conservation and management of the province's grizzly bear population. Major components of the province's conservation strategy include conservatively regulating the number of grizzly bears that hunters kill each year and establishing a network of core and benchmark grizzly bear management areas (GBMAs) that include adequate no-hunting zones in each of the 57 grizzly bear population units.<sup>18</sup> Despite a great deal of public input and scientific analysis, neither of these strategies has been adequately implemented to date.<sup>19</sup>

**Grizzly bears that depend on salmon-spawning habitats often have greatly reduced food resources in some years, which can negatively affect reproductive and population persistence rates.**

NATHAN DE BRUYN PHOTO





# Public opinion on grizzly bear hunting

MANY BRITISH COLUMBIANS BELIEVE THAT HUNTING GRIZZLY BEARS FOR SPORT OR TROPHIES should not be allowed. A statistically valid telephone survey recently conducted by McAllister Opinion Research indicates that 79 per cent of British Columbians support a ban on sport trophy hunting of grizzly bears in parks and protected areas, and 73 per cent support expanding that ban to the entire province. A majority (84 per cent) agree that investing in opportunities for people to learn about and see grizzly bears in the wild is more sustainable than shooting them, and almost as many agree that killing grizzly bears for trophies (79 per cent) or sport (76 per cent) is unethical.

Despite the overwhelming public opposition to hunting grizzly bears for trophies and/or sport, and the economic benefits of viewing and photographing them rather than killing them, these magnificent animals are managed by the Ministry of Environment's Fish and Wildlife Branch as "big game" under the provincial *Wildlife Act*, the main provincial law for protecting wildlife, endangered species, and wildlife habitat. Like other game species (including black bear, elk, deer, and cougar), grizzly bears and their habitat are managed ostensibly to maximize "recreational and commercial use" of the species on a "sustainable" basis.<sup>20</sup> This generally translates into how many grizzly bears hunters can kill, which has averaged 253 annually since 2001. Figure 1 shows how many grizzlies have been legally hunted annually since 1977.

Hunters can kill grizzly bears in 48 of B.C.'s 57 population units, and have legally hunted grizzly bears in at least 57 parks and protected areas in the past. Map 1 shows the current status of grizzly bear populations (GBPUs) in B.C. and where hunting is considered acceptable. Nine population units in southern B.C. are listed as "threatened," which automatically precludes sport hunting.

Wherever it occurs, grizzly bear hunting is managed through what is called a "limited entry" hunt. Using a Byzantine method of accounting that includes what several independent and qualified experts consider unreliable populations estimates,<sup>21</sup> provincial biologists regulate grizzly bear hunting using a lottery system.



PAUL HEPPNER PHOTO

Hunters can kill grizzly bears in 48 of B.C.'s 57 population units, including most parks and protected areas.

This means that British Columbians with a resident hunting licence can enter a random draw for the opportunity to “win” a tag to hunt a grizzly bear in designated parts of British Columbia. Guide outfitters also receive quotas, which set the maximum number of grizzly bears that resident and non-resident hunters can kill in a given guide outfitter’s area.

Since 1977, the earliest date that accurate records were kept, until the end of 2009, resident and non-resident trophy hunters have killed at least 9,484 grizzly bears (Figure 1). Since 2004 alone (when revisions were made to provincial population estimates), hunters killed 1,773 grizzly bears (1,174 males and 593 females, as well as six unidentified individuals) in B.C.

According to the government, “this system allows wildlife biologists to carefully regulate harvest levels in each area where grizzly bear hunting is allowed.”<sup>22</sup> However, our analysis of recent rates of human-caused mortality indicates that hunting grizzly bears is contributing significantly to an unsustainable level of grizzly bear mortality in British Columbia.

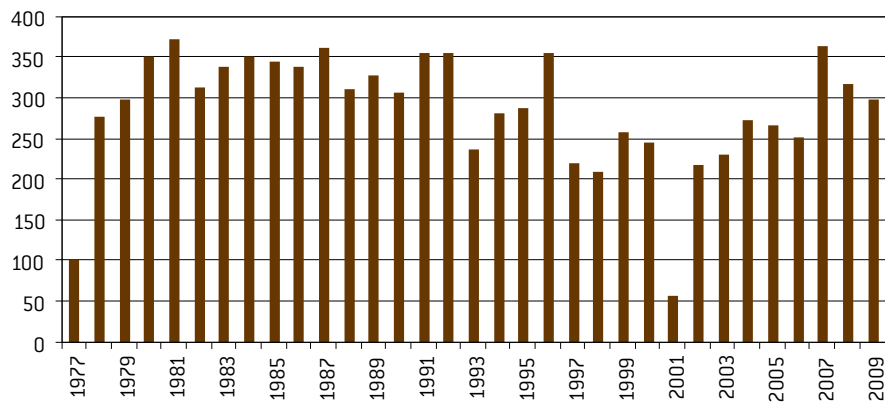
Map 1: Grizzly bear population units in British Columbia



Source: See Appendix.

**Figure 1: Number of bears killed by hunters, 1977 to 2009**

Since 1977, hunters have killed 9,484 grizzlies in B.C. A province-wide moratorium on grizzly hunting was instituted in early 2001 by the government of the day but then lifted in that the same year after the government was defeated in a provincial election. Fifty-eight grizzlies were killed by hunters during the 2001 fall hunt after the hunt was reinstated by the new government. An average of 253 grizzly bears have been killed by hunters each year since the trophy hunt was reinstated in 2001.



Source: See Appendix.

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# Killing grizzlies in protected areas

Since 1977, 638 grizzly bears have been killed in 60 of B.C.'s protected areas.

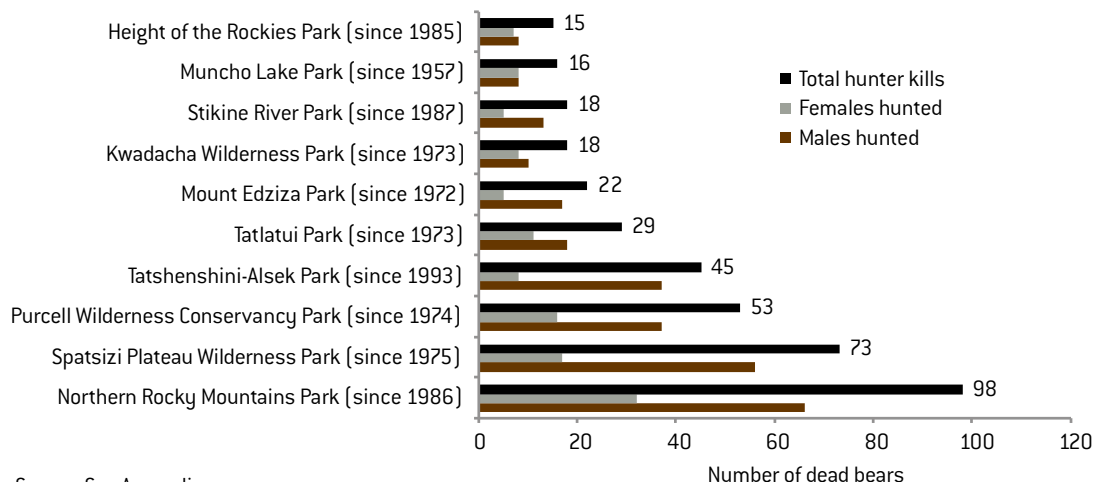
WHEN IT COMES TO GRIZZLY BEARS IN B.C., PROVINCIAL “PROTECTED AREAS” ARE NOT WHAT THEY SEEM.

Like most land-use designations, B.C.'s parks and protected areas serve multiple, often conflicting purposes.<sup>23</sup> According to the Ministry of Environment, they are managed for both “important conservation values” and “for the inspiration, use and enjoyment of the public.” While this means large-scale industrial activities are generally prohibited, recreational and commercial use are often encouraged. And a big part of that “use and enjoyment” is killing grizzly bears for sport.<sup>24</sup>

More than 100,000 square kilometres (13.4 per cent) of occupied grizzly bear habitat is protected in B.C.,<sup>25</sup> but that doesn't mean grizzly bears don't die there. In fact, since 1977, 638 grizzly bears have been killed in 60 of B.C.'s protected areas (Figure 2). A small number of these mortalities (91) were

Figure 2: The 10 B.C. protected areas with the highest number of hunting kills

From the time they were established, data to 2008



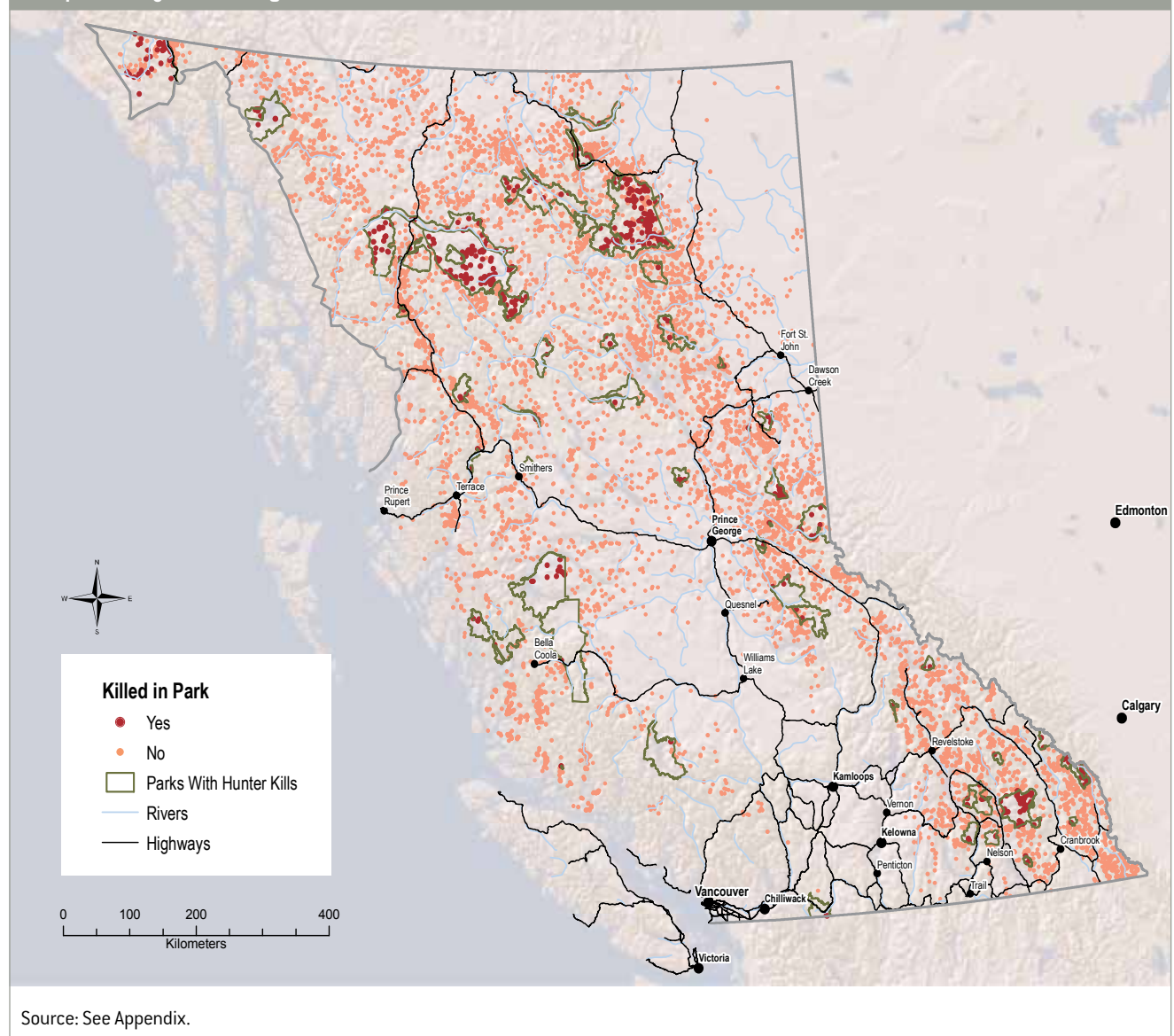


management kills or illegal poaching, but 547 grizzlies were killed by resident and non-resident sport hunters who were legally entitled to aim down the barrel of a rifle at a grizzly bear and pull the trigger. Map 2 shows all hunting kills in B.C., including hunting kills in protected areas.

Between 2004 and 2008, years for which the government has relatively accurate population estimates,<sup>26</sup> 139 grizzly bears in 23 grizzly bear population units were killed by hunters in B.C. protected areas – 29 grizzlies in 2008 alone. In many cases, these hunter kills contributed significantly to levels of grizzly bear mortality in excess of the government’s own allowable human-caused mortality rates (also known as the allowable HCM rate).



Map 2: Grizzly bear hunting kills in B.C., 1977 to 2008







For more than two decades, biologists have been trying to figure out what is the biologically acceptable level of annual human-caused mortality that a hunted grizzly bear population can withstand without adverse impacts. IAN MCALLISTAR PHOTO

# Too many dead bears

FOR MORE THAN TWO DECADES, BIOLOGISTS HAVE BEEN TRYING TO FIGURE OUT WHAT IS THE biologically acceptable level of annual human-caused mortality that a hunted grizzly bear population can withstand without adverse impacts. In other words, how many grizzly bears can humans kill each year without causing the population to decline and eventually disappear?

The answer depends on several factors, including the productivity (i.e., the quality) of the habitat (e.g., availability of food), the population's reproductive rate, and the size of the population. Some research indicates that populations can sustain an annual human-caused mortality rate of three to five per cent before they start to decline; however, this is a generalization that doesn't always hold true. Populations smaller than 100 individuals, or populations inhabiting poor habitat or areas where human disturbance has lowered overall abundance and availability of foods, may not be able to sustain even extremely low levels of annual, human-caused mortality.<sup>27</sup> Many population units in British Columbia fall into these categories. Because adult females are the reproductive engines of any population, most jurisdictions, including B.C., Alberta, and the United States, attempt to limit female mortality to no more than 30 per cent of total human-caused mortality in a given year (i.e., 0.9 to 1.5 per cent of the entire population).<sup>28</sup>

In British Columbia, the provincial government uses a complicated mathematical calculation to figure out how many bears in any particular grizzly bear population unit (GBPU) can be killed by humans each year. In grizzly bear population units that have been deemed "threatened," the annual allowable human-caused mortality rate (HCM) has been set at zero and no grizzly bear hunting is allowed.<sup>29</sup>

But in grizzly bear population units that are deemed "viable," the annual allowable human-caused mortality rate has been set from two per cent of the estimated population in the South Purcell GBPU to 4.1 per cent in the Kingcome-Wakeman and the Upper Skeena-Nass GBPU. The other 46 grizzly bear population units are somewhere in between.<sup>30</sup>

This limit, along with a population estimate, is supposed to allow wildlife managers to figure out how many grizzly bears hunters can kill each year without causing a population to decline. By subtracting the number of grizzlies killed as a result of poaching, collisions, and bears killed in defence of people and property (the total of which can be as high as 32, as in the Rocky GBPU in 2004), managers determine how many grizzly bears can be killed by trophy hunters in subsequent years.<sup>31</sup>



J.LIEBE PHOTO

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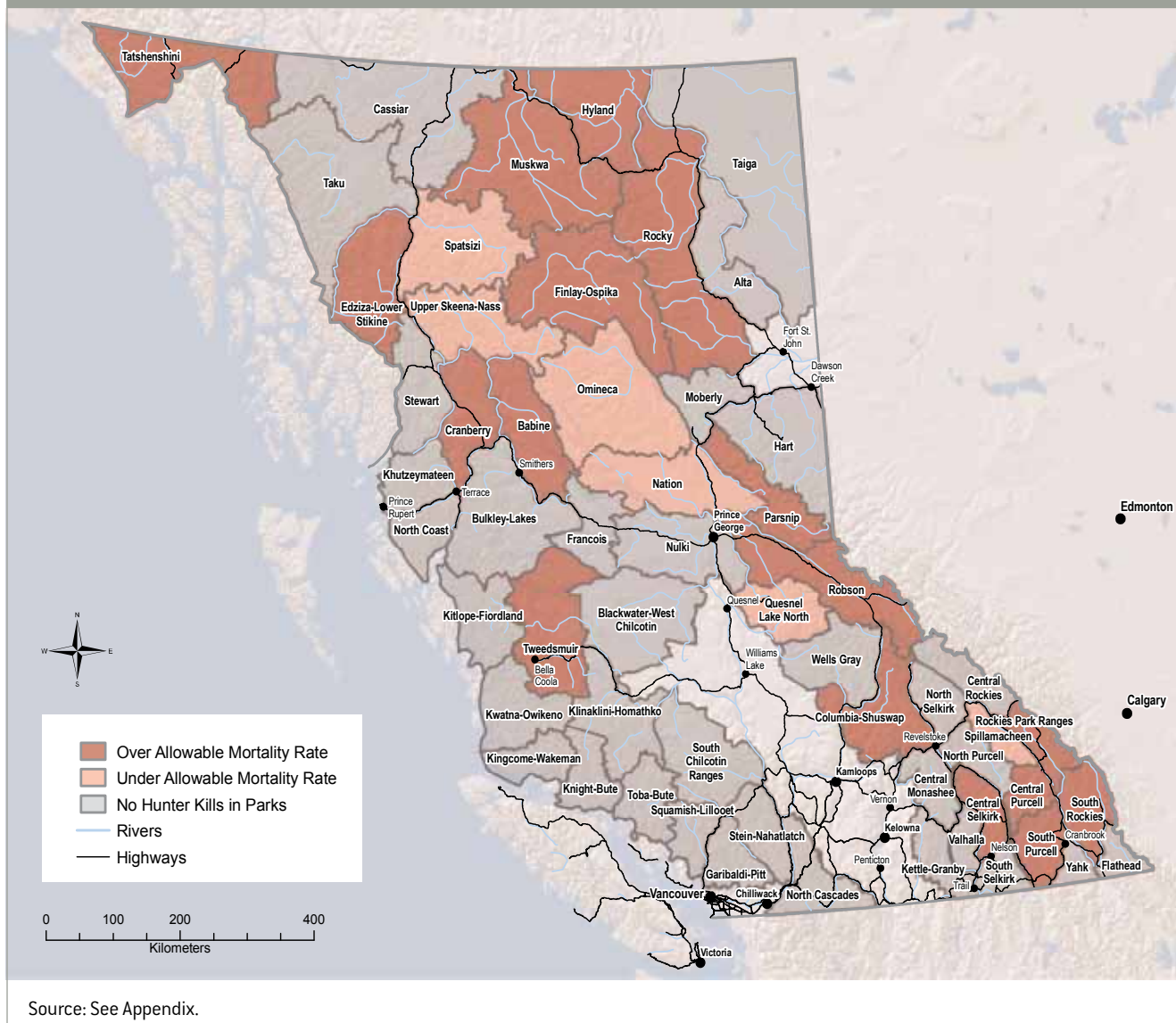


## HUNTING KILLS IN PROTECTED AREAS

This method may work fine in theory, but on the ground it often results in too many dead grizzlies, even by the government's own reckoning. For example, between 2004 and 2008, years for which the government has relatively accurate population estimates and detailed mortality data, hunters killed 139 grizzly bears in protected areas.

During this five-year period, the allowable human-caused mortality rates were surpassed at least once in 17 of the 23 grizzly bear population units in which hunters killed grizzly bears in protected areas. Figure 3 lists those GBPU's in which the actual number of bears that were killed exceeded the allowable mortality rates set by government, in some cases by more than 100 per cent. The location of these GBPU's is also shown in Map 3.<sup>32</sup>

**Map 3: Grizzly Bear Population Units in which grizzlies were both hunted in protected areas and total mortality (hunting kills and non-hunting kills) exceeded allowable rates in at least one year between 2004 and 2008**



Source: See Appendix.



For instance, in 2004, hunters killed one female and two male grizzly bears in protected areas in the Central Purcell GBPU. With a population of only 86 bears, these hunter kills (along with three females and one male killed by other causes) resulted in the total allowable mortality rate being surpassed (by 170 per cent).

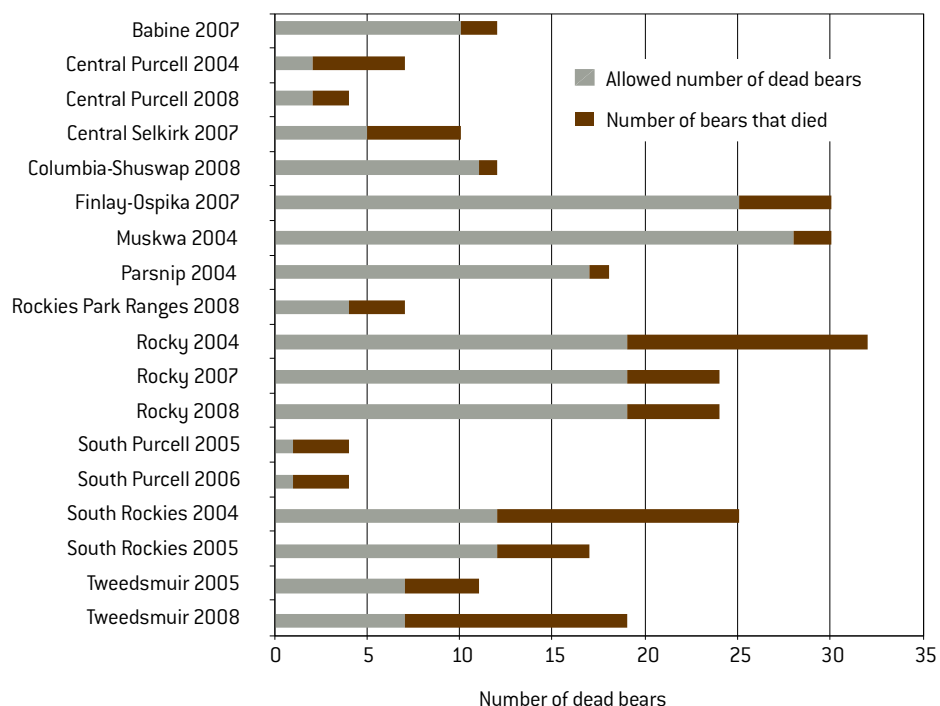
The story was the same in the South Purcell GBPU in both 2005 and 2006 where trophy hunter kills within in a protected area (Purcell Wilderness Conservancy Park) contributed to the total allowable mortality rate being exceeded by 115 per cent. The Rocky GBPU, with nine hunter kills in protected areas in both 2007 and 2008, contributed to allowable mortality limits being exceeded (by 23 per cent) in both years.

It is important to note that these are but a few examples of how the government's own grizzly bear mortality limits were exceeded 41 times between 2004 and 2008<sup>33</sup> – partly because of hunter kills in protected areas.



**Figure 3: Grizzly Bear Population Units in which grizzlies were both hunted in protected areas and total grizzly mortality exceeded the allowable human-caused (HCM) rates at least once between 2004 and 2008**

For example, in the Tweedsmuir GBPU in 2008, the allowable human-caused mortality (HCM) rate was seven grizzlies (shown in grey), while the total number of bears that died that year in the Tweedsmuir GBPU was 19 (shown in red).



Source: See Appendix.

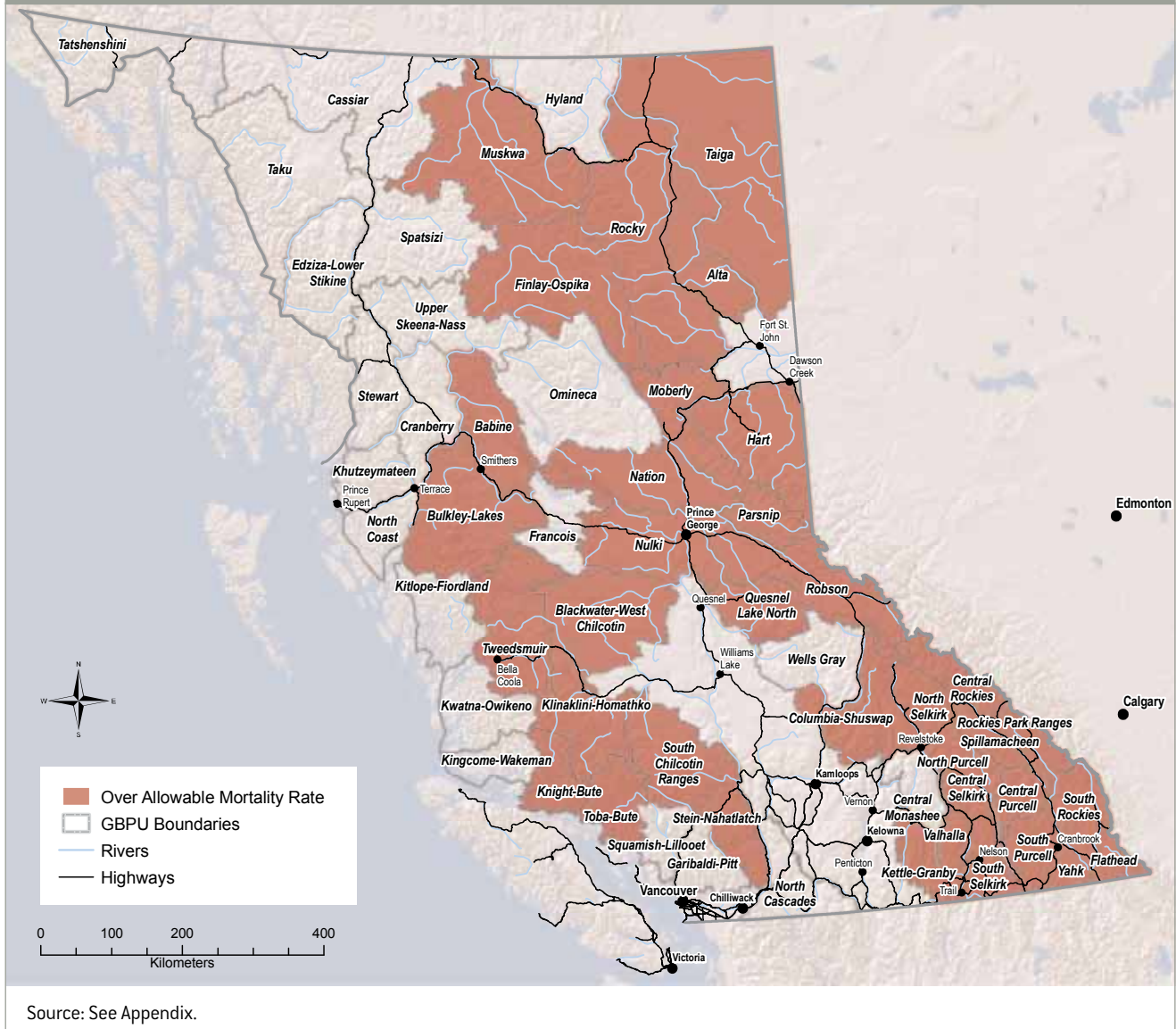
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## ALL MORTALITY IN ALL GBPUs

Map 4 shows GBPUs where mortality by humans exceeded allowable rates of mortality at least once between the years of 2004 and 2008.<sup>34</sup> Between 2004 and 2008, 63 per cent of GBPUs (36 out of 57) exceeded the allowable mortality rates at least once over that five-year period. If we look at only hunting kills, 35 per cent of GBPUs (20 out of 57) had a hunting kill rate that exceeded the allowable mortality rate at least once between 2004 and 2008.

The impacts of trophy hunting on grizzly bear mortality have had a more negative impact in some GBPUs than others. Figure 4 shows four GBPUs where both the total actual human-caused mortality rate and the hunting kill rate went over the allowable limits in at least three out of five years between 2004 and 2008 (Central Rockies, Flathead, North Purcell, and South Purcell GBPUs). The allowable HCM rate was exceeded by more than 50 per cent in the Central Rockies GBU in 2008 (by 60 per cent),

**Map 4: Grizzly Bear Population Units where human-caused mortality (hunting kills and non-hunting kills) exceeded allowable rates in at least one year between 2004 and 2008**



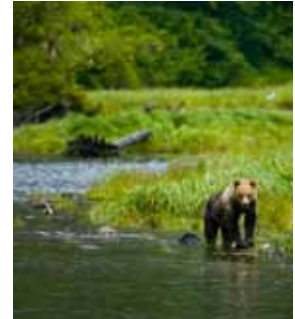
the North Purcell in 2005 (by 61 per cent), and the South Purcell GBPU in 2004, 2006, and 2007 (by 63 per cent in all three years).

There is strong evidence that ending grizzly hunting would effectively reduce overall human-caused mortality to levels that are considered more sustainable by the government. For example, if hunting were not a factor in the Central Rockies GBPU, human-caused mortality would have fallen below the allowable mortality rate in 2004, 2007, and 2008.

Similarly, without hunting, the total mortality of grizzly bears in the Flathead GBPU would have been far below the allowable HCM rate of 2.3 per cent (or three grizzlies) in 2004, 2006, and 2007.

Without trophy hunting, the total bear mortality in the North Purcell GBPU would have been zero in 2005, 2007, and 2008 (well below the allowable HCM rate of 3.8 per cent, or eight grizzlies permitted to be killed each year).

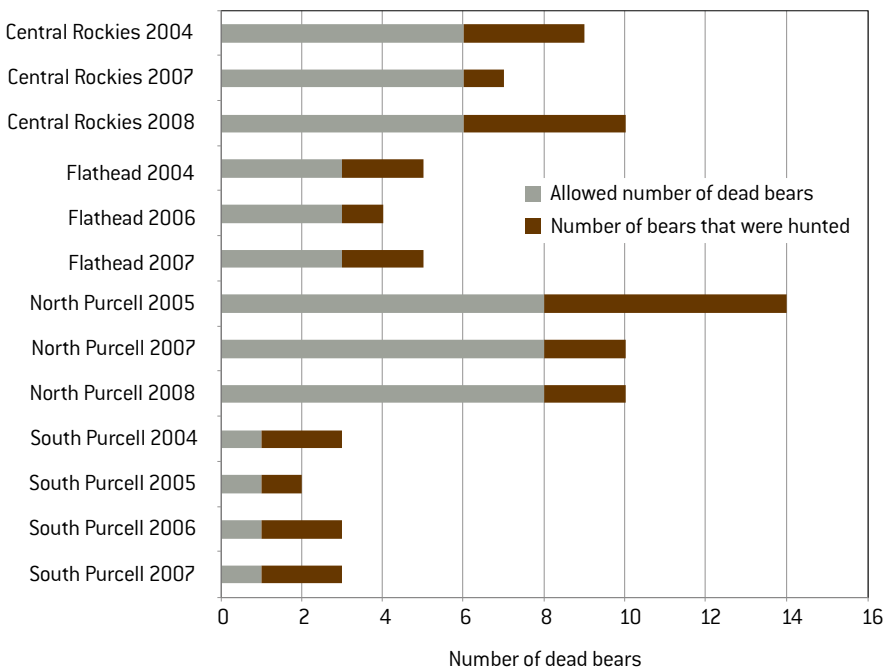
Similarly, removing hunting would have effectively dropped grizzly mortality down to allowable levels in the South Purcell GBPU (one dead bear a year) in 2004, 2006, and 2007.



NATHAN DE BRUYN PHOTO

**Figure 4: Grizzly Bear Population Units in which hunter kills exceeded the allowable human-caused mortality (HCM) rates at least three times between 2004 and 2008**

For example, in the South Purcell GBPU in 2007, the allowable human-caused mortality (HCM) rate was one grizzly (shown in grey), while the total number of bears that were hunted that year in the South Purcell GBPU was three (shown in red).



Source: See Appendix.

There is strong evidence that ending grizzly hunting would effectively reduce overall human-caused mortality to levels that are considered more sustainable by the government.



In total, the provincial grizzly bear population estimate dropped by 963 individuals, or 5.7 per cent of the original population estimate due to a revision in the way population numbers are determined. PAUL HEPPNER PHOTO





# Counting bears to kill bears

IT'S IMPORTANT TO NOTE THAT THIS ANALYSIS WAS DONE USING THE MOST RECENT ITERATION [2008] of the government's official population estimates. There has been a great deal of criticism of the habitat-based density population model, called the Fuhr-Demarchi methodology, which is used to estimate the number of grizzly bears in British Columbia. Critics claim that the wide margin of error inherent in the Fuhr-Demarchi methodology may make it inadequate to calculate sustainable levels of grizzly bear hunting in British Columbia.<sup>35</sup> Even more sophisticated DNA-based population inventories may not be adequately accurate to calculate sustainable harvest levels.<sup>36</sup>

The recent 2008 revision of the province's population model seems to support these claims. Based on "local knowledge about population distribution, density and abundance," recent DNA-based inventories, and "more recent data inputs" for the population model, estimated population sizes were reduced for six grizzly bear population units: Babine, Central Purcell, Central Rockies, Nation, Omineca, and Robson.<sup>37</sup> Two additional population units, South Purcell and Yahk, were also revised based on another recent DNA-based inventory by Proctor et al. (2007)<sup>38</sup> (Table 1 on page 22).

In total, the provincial grizzly bear population estimate dropped by 963 individuals, or 5.7 per cent of the original population estimate due to a revision in the way population numbers are determined.<sup>39</sup> All eight revised population estimates were lower – some by more than 100 per cent – than the 2004 population estimates that were being used to calculate annual allowable mortality and harvest quotas.

This overestimation of grizzly bear populations contributes to overestimating sustainable levels of human-caused mortality, including hunting quotas, in each of these grizzly bear population units, and such overestimating might reasonably result in population declines. In light of the fact that all re-estimates were drops, it is possible, and worrisome, that new updates will mean that allowable human-caused mortality rates are being exceeded by more, more often and in more grizzly bear population units than is suggested here.



Given the difficulty of accurately estimating bear populations, and the consequences of overestimating them and the precautionary principal, many biologists have recommended that sport hunting be suspended or much more conservatively managed in B.C.

Given the difficulty of accurately estimating bear populations, and the consequences of overestimating them and the precautionary principle, many biologists have recommended that sport hunting be suspended or much more conservatively managed in B.C.<sup>40</sup>

Table 1 shows that there are now an estimated 963 fewer grizzlies in B.C. than was previously thought.

Table 1: Grizzly Bear Population Units with recently revised population numbers		
	2004 population estimate	2008 population estimate
Babine	487	286
Central Purcell	150	86
Central Rockies	235	173
Nation	484	241
Omineca	726	481
Robson	689	631
South Purcell	158	92
Yahk	44	20

## NO-HUNTING AREAS MEAN HEALTHIER BEAR POPULATIONS

No-hunting areas have long been used as a successful way to safeguard bear populations from the uncertainties associated with population estimates and hunting quotas, especially in landscapes subject to habitat alterations by humans.<sup>41</sup>

One of the best documented examples of this in North America was developed for black bears in North Carolina in 1971. The state created 28 black bear no-hunting “sanctuaries” to ensure the survival of black bears and to “provide for the continued production of a harvestable surplus of bears for sport hunting” in surrounding areas.<sup>42</sup> The largest of these, Pisgah, was 2,350 square kilometres in size.

A subsequent population study in the area concluded that “sanctuaries appear to be a good means of managing black bears,” and that “decreasing human access to bears and their habitat appears crucial, either by making sanctuaries larger or, especially, by eliminating roads.”<sup>43</sup> The same study concluded that, although there were benefits, even the largest sanctuary “may not provide its resident bears with enough protection to maintain a viable, core breeding population within its boundaries.”

The elimination of grizzly bear sport hunting has also been instrumental in the successful recovery of the Yellowstone grizzly bear population in the United States, which has been protected under the U.S. Endangered Species Act since 1975.<sup>44</sup>

In 1984, the B.C. Wildlife Branch established a large no-hunting zone centred on the Khutzymateen Valley on B.C.’s north coast, which was subsequently protected as Canada’s first grizzly sanctuary. In the early 1990s, the Wildlife Branch also established a second no-hunting zone on the upper Kitimat River between Terrace, Kitimat, Telkwa, and Houston. According to wildlife biologist Wayne McCrory, who reviewed pre-designation hunting mortality data for the Khutzymateen Valley, the no-hunting designation there has likely played a major role in sustaining one of the healthier grizzly populations on the B.C. coast today.<sup>45</sup>

More recently, in 2009 the province announced several new no-hunting zones in the Great Bear Rainforest as result of mid- and north-coast Local Resource Management Plans (LRMP). One was added to the central coast (Kimsquit-Upper Dean-Tweedsmuir) and one on the south coast (Ahnuhati-Ahta Kwalate). The Khutzymateen-Nass-Skeena no-hunting zone was expanded, but the one in the upper Kitimat River was removed.

# The case for a network of protected no-hunting zones in B.C.

HUMANS ARE KILLING TOO MANY GRIZZLY BEARS IN BRITISH COLUMBIA AND THE largest source of mortality by far is hunting. The easiest way for the government to meet its own human-caused mortality targets is to eliminate grizzly bear hunting in all parks and protected areas, as well as to establish a comprehensive network of *core and benchmark no-hunting zones containing high-quality grizzly bear habitat* across the province.

This is not a new idea. Grizzly Bear Management Areas (GBMAs) that are off-limits to hunting have long been a part of the B.C. government's stated policy to "maintain in perpetuity the diversity and abundance of [B.C.'s] grizzly bears."<sup>46</sup>

For example, in 1995, the government developed and released a comprehensive strategy for grizzly bear conservation in the province. Called the *British Columbia Grizzly Bear Conservation Strategy*, it was "designed to help reverse the loss of grizzly bears in British Columbia":

*much of existing grizzly bear habitat ... is considered threatened and nearly all grizzly bear ecosystems in British Columbia are at risk under current land use activities. Our increasing population and growing demands for land and resources continue to threaten grizzly bears and their habitats.*<sup>47</sup>

One of the key recommendations of B.C.'s *Grizzly Bear Conservation Strategy* was the establishment of a network of Grizzly Bear Management Areas that "protect grizzly bear populations by ensuring that activities that are not compatible with grizzly bears are carefully controlled or not allowed." This includes hunting.



Humans are killing too many grizzly bears in British Columbia and the largest source of mortality by far is hunting.

According to the *Grizzly Bear Conservation Strategy*, these GBMAs will:

- contain high quality grizzly bear habitat,
- be closed to grizzly bear hunting,
- control other recreational activities that might be detrimental to grizzly bear habitats (such as off-road vehicle use),
- be managed to secure the long-term survival of grizzly bear populations, and
- wherever possible, be connected by linking corridors that contain the habitat requirements for grizzly bears to travel between management areas.

Although the government identified a network of no-hunting GBMAs as a priority more than a decade ago in its official *Grizzly Bear Conservation Strategy* and independent bear experts have consistently called for such a network, the government has been slow to fully implement this important policy for grizzly bear conservation.

This commitment to GBMAs was reinforced by a blue-ribbon panel of grizzly bear experts appointed by the government in 2002. The B.C. government's Grizzly Bear Scientific Advisory Panel concluded that "the concept of establishing large, protected GBMAs in BC has considerable value as a strategy for maintaining the long-term viability of grizzly bear populations." The panel also recommended that the B.C. government establish a network of *connected* GBMAs that *preclude grizzly bear hunting*.<sup>48</sup>

An independent assessment of GBMA requirements published in 2004 by a renowned group of grizzly bear experts in Canada and the U.S. concluded that in order to adequately protect grizzly bears in B.C., the GBMA network would need to cover 68 to 84 per cent of the habitat currently occupied by grizzly bears, or approximately 547,740 to 676,620 square kilometres in the province.<sup>49</sup> Each GBMA must be large enough to support an effective population of 500 grizzly bears at a minimum density of 10 bears per 1,000 square kilometres, which means the GBMAs would range from 10,000 to 50,000 square kilometres in size, depending on the habitat quality and bear density in any given Grizzly Bear Population Unit.<sup>50</sup>

## B.C.'S UNFULFILLED COMMITMENT TO GRIZZLY BEAR MANAGEMENT AREAS

Although the government identified a network of no-hunting GBMAs as a priority more than a decade ago in its official *Grizzly Bear Conservation Strategy* and independent bear experts have consistently called for such a network, the government has been slow to fully implement this important policy for grizzly bear conservation. The Khutzeymateen Grizzly Bear Management Area was designated in 1984. The Ahnuhati-Ahta Kwalate, Kimsquit-Upper Dean-Tweedsmuir, and an expanded no-hunting zone around the Khutzeymateen (Nass-Skeena ) were recently designated in the Great Bear Rainforest as new no-hunting zones. However, these GBMAs are too few, and are far from the comprehensive network that was promised by government more than 10 years ago. And because most grizzly bear mortality occurs in the B.C. Interior rather than on the coast, Grizzly Bear Management Areas that are off limits to hunting need be designated there as well.

B.C.'s *Grizzly Bear Conservation Strategy* sums it up well: "We have the opportunity – and the global responsibility – to protect British Columbia's remaining Grizzly Bears. We owe it to ourselves, to our descendants and to the Grizzly Bears to implement a strategy for the survival of this majestic creature."<sup>51</sup>

Prohibiting grizzly bear hunting in B.C.'s parks and protected areas and fulfilling the commitment to a comprehensive network of Grizzly Bear Management Areas that is off limits to hunting would be a good place to start.





NATHAN DE BRUYN PHOTO

## ENSURING A FUTURE FOR B.C.'S GRIZZLY BEARS: KEY ACTIONS NEEDED

1. Government should enact regulations under the *Wildlife Act* to ensure that grizzly bears are protected from trophy hunting within BC's parks and protected areas.
2. Government should establish a comprehensive network of core and benchmark Grizzly Bear Management Areas (GBMAs) as mandated in the British Columbia Grizzly Bear Conservation Strategy, that are off-limits to hunting in most of the habitat currently occupied by grizzly bears in BC. This network should be designed according to scientific criteria recommend by Gilbert et al.,<sup>52</sup> including being protected from all ecologically damaging human activities, providing sufficient habitat to sustain viable populations of grizzlies within their natural range, and being connected on the landscape.

## Flathead Grizzly Bear Population Unit

**This region supports the highest densities of interior grizzly bears in Canada or the contiguous US. A total of 188 grizzly bears are known to have been killed by people in the Flathead GBPU between 1977 and 2008, 157 of them by sport hunters.**

FLATHEAD WATERSHED/  
HARVEY LOCKE PHOTO

THE FLATHEAD RIVER WATERSHED IS THE HEART OF B.C.'S FLATHEAD GRIZZLY BEAR POPULATION UNIT (GBPU), one of the most biologically important places on Earth. As rich as the Okavango Delta or the Serengeti, it is unmatched in North America for the variety, completeness, and density of carnivore species that live and breed there – especially grizzly bears. This region supports the highest densities of interior (i.e., non-coastal) grizzly bears in Canada or the contiguous United States.<sup>53</sup> A recent report, however, suggests that the Flathead Valley population of grizzlies has been in decline for the past decade.<sup>54</sup>

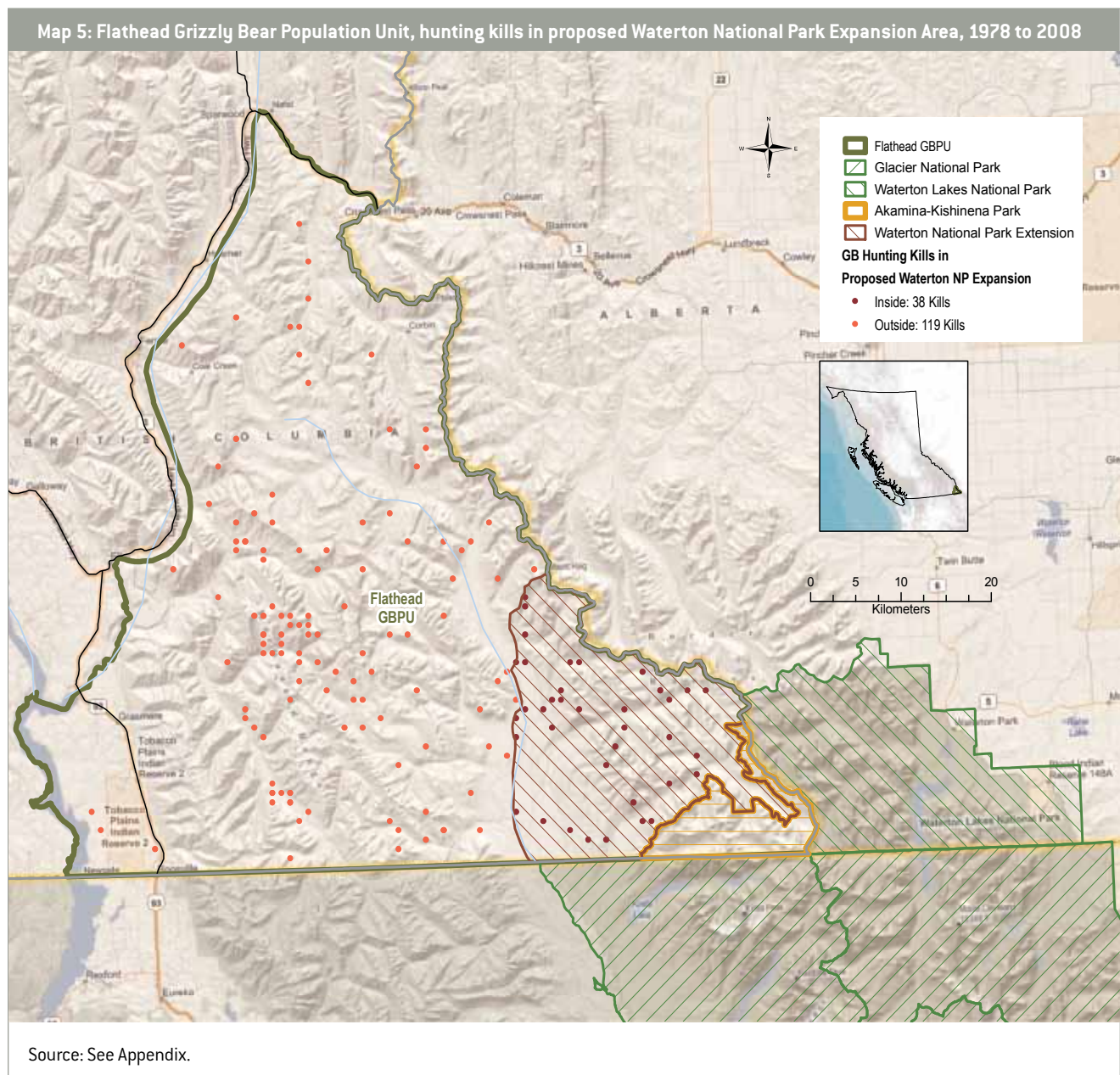
According to the B.C. government's population estimate, 151 grizzly bears live in the 3,434-square-kilometre Flathead GBPU at a density of 44 bears per 1,000 square kilometres. This is 70 per cent of the potential population estimate of 215 bears that could be supported by the habitat in this GBPU.<sup>55</sup> Other population inventories indicate the bear density may be as high as 80 bears per 1,000 square kilometres.<sup>56</sup> As a result of all available information, the B.C. government set the allowable human-caused mortality (HCM) rate for the Flathead GBPU, including sport hunting kills, at 2.3 per cent of the population estimate.





A total of 188 grizzly bears are known to have been killed by people in the Flathead GBPU between 1977 and 2008, 157 of them by sport hunters. Map 5 shows the location of these hunter kills. Between 2004 and 2008, the period for which the most reliable population data is available, the total allowable human-caused mortality rate was exceeded in four of the five years (once by 130 per cent). This indicates that the annual grizzly bear hunt in this GBPU is not sustainable, and that limiting the trophy hunting of grizzly bears in the region is necessary.

Several conservation groups have recognized the importance of the Flathead River Valley to large-carnivore conservation and have recommended that a small portion in the southeast corner of the GBPU be designated a new national park, perhaps as an addition to the existing Waterton-Glacier International Peace Park (Map 5). If the park had been established and made off limits to hunting, total human-caused mortality would have been well below the government's own allowed mortality rate at 1.3 per cent in several years.





## Rocky Grizzly Bear Population Unit

**This region has suffered from extremely high levels of grizzly bear mortality due to trophy hunting**

THE ROCKY GRIZZLY POPULATION UNIT SPORTS THE SECOND LARGEST GRIZZLY BEAR population in B.C. (730). It is also a region that has suffered from extremely high levels of grizzly bear mortality due to trophy hunting.

Located in the much-heralded Muskwa-Kechika Management Area in the northeast corner of the province, the Rocky GBPU provides good wilderness habitat for grizzly bears and a wealth of other wildlife species, all of which are ostensibly protected by three provincial parks: Northern Rocky Mountains Provincial Park (top), Graham-Laurier Provincial Park (middle), and Redfern-Keilly Provincial Park (bottom) (Map 6).

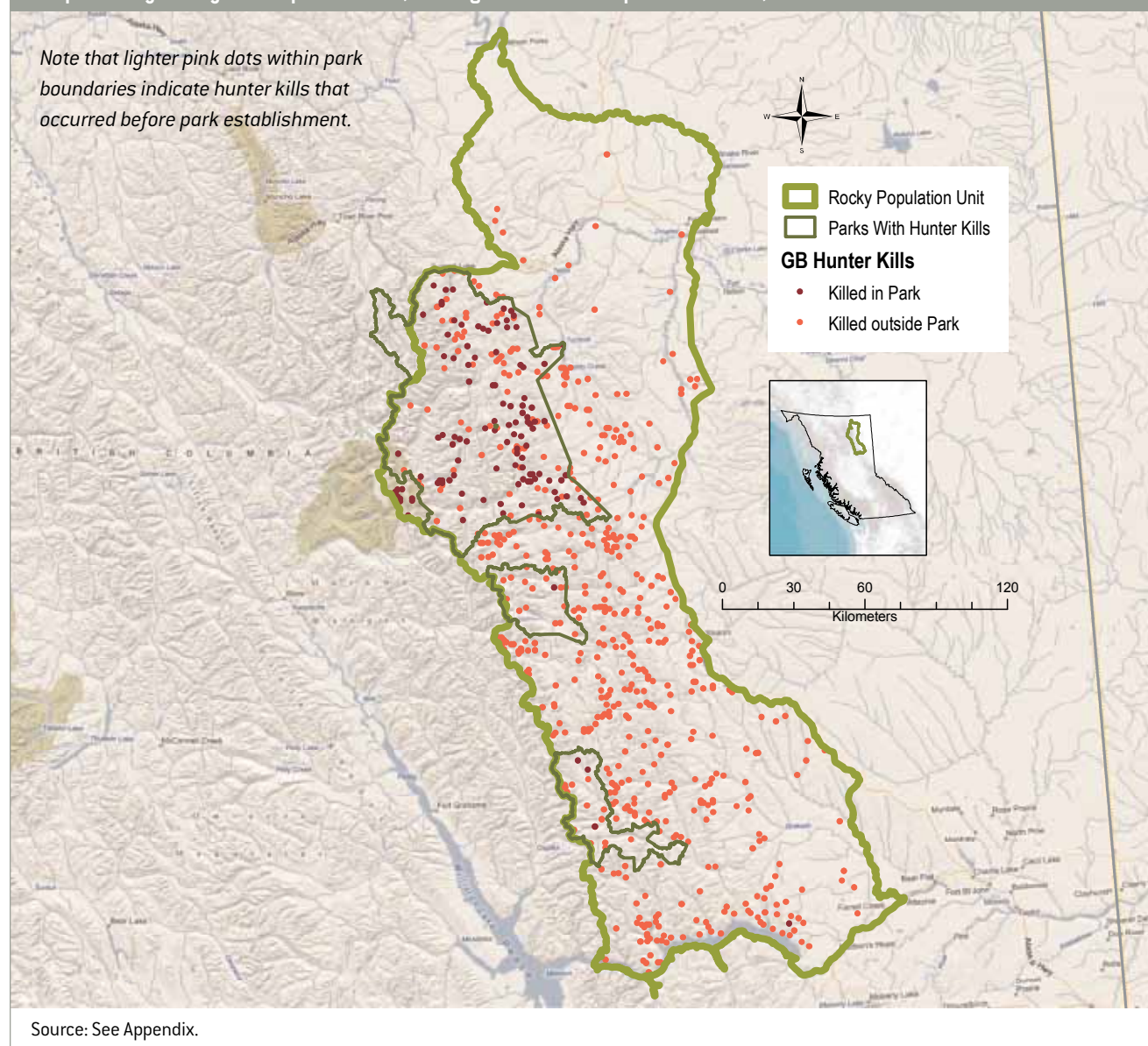


Mortality inside and outside these parks has been quite high. People killed 831 grizzly bears between 1977 and 2008, and 716 of these deaths occurred due to sport hunting. Map 6 shows hunter kills in the Rocky GBPU. Between 2004 and 2008, the period for which the most accurate population data is available, humans killed 109 grizzly bears in this GBPU for an average human-caused mortality of almost 22 bears per year, over the allowable human-caused mortality rate of 19 bears per year.

Hunters killed 103 grizzlies in the GBPU's three protected areas since they were created in 1999, for an average of more than 10 kills per year. Of those kills, 98 were in Northern Rocky Mountains Provincial Park alone, making it the best park in B.C. to watch a grizzly bear get shot to death by a sport hunter.

Total human-caused mortality rates were exceeded a total of three times in the Rocky GBPU between 2004 and 2008. The allowable total mortality rate was exceeded in 2004 (by 65 per cent), 2007 (by 23 per cent), and 2008 (by 23 per cent). The over-killing of bears in this GBPU indicates that the grizzly bear hunt is not sustainable in the Rocky region and should be limited.

**Map 6: Rocky Grizzly Bear Population Unit, hunting kills and kills in protected areas, 1977 to 2008**



## Tatshenshini Grizzly Bear Population Unit

The Tatshenshini Grizzly Population Unit is an exceptionally important landscape, with unique geographic characteristics that have produced an unusual diversity of wildlife species. Many of the area's plant and wildlife species are at either the northern or southern limits of their range. This encourages adaptive evolution and provides a laboratory for naturally increasing genetic diversity, which can help species survive long-term environmental change such as global warming.

**This is an exceptionally important landscape, with unique geographic characteristics that have produced an unusual diversity of wildlife species.**

Not surprisingly, the Tatshenshini GBPU includes some of the most productive grizzly bear habitat in North America, supporting a population of approximately 360 grizzlies.<sup>57</sup> Three protected areas – Tatshenshini-Alsek Provincial Park, Atlin Recreation Area, and approximately half of Atlin Provincial Park – ostensibly protect this population. Along with Kluane National Park in the Yukon and Glacier Bay and Wrangell-St. Elias national parks in Alaska, Tatshenshini-Alsek is part of a transboundary UNESCO World Heritage Site and is considered to be a “potential grizzly bear ecosystem of national and international significance.”<sup>58</sup>

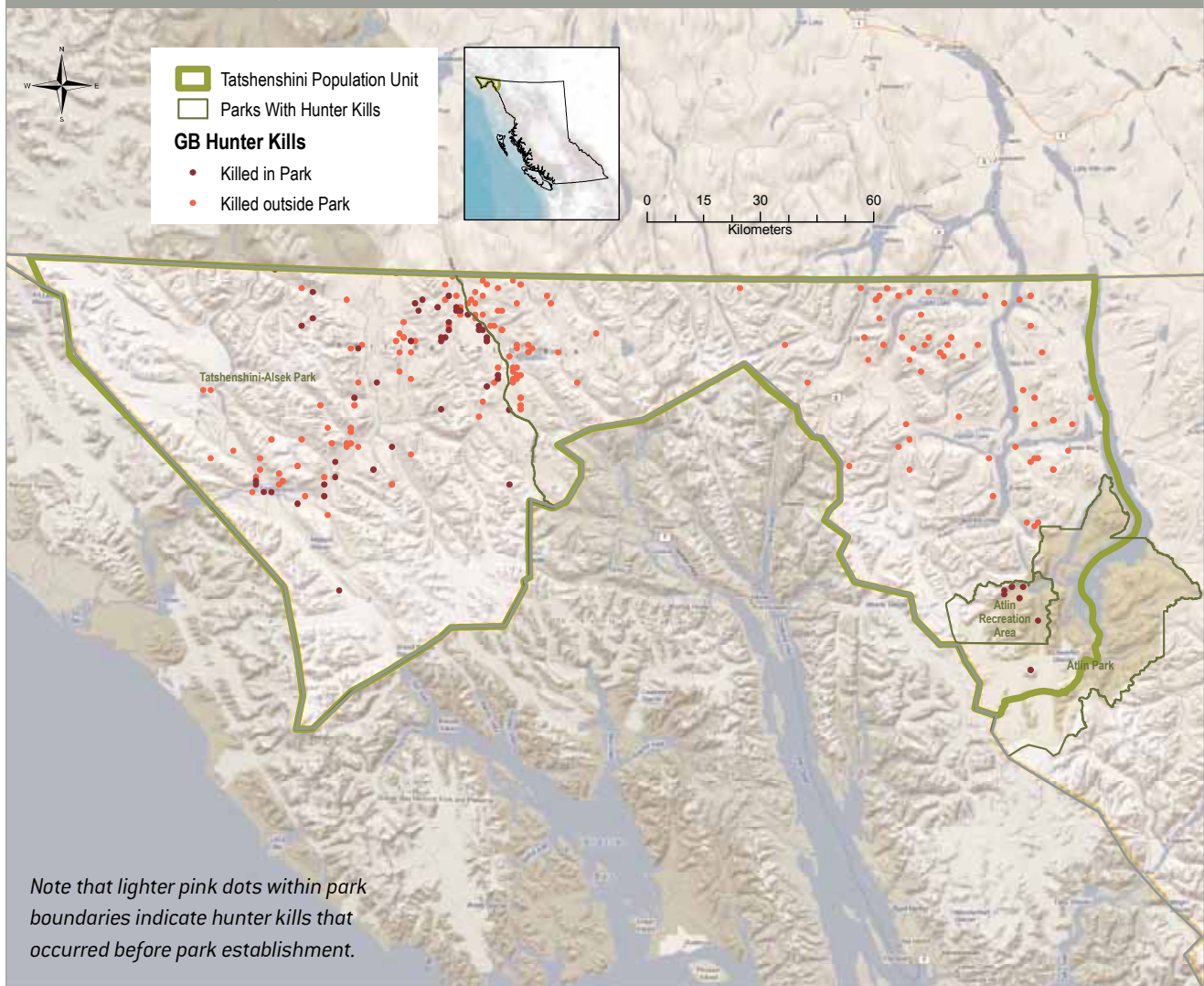
However, humans have killed 222 grizzly bears in this GBPU since 1977, with hunters killing 220 of them. Map 7 shows the Tatshenshini GBPU with hunter kills. Hunters have killed 45 grizzly bears in Tatshenshini-Alsek Provincial Park alone since it was created in 1993.







Map 7: Tatshenshini Grizzly Bear Population Unit, hunting kills in protected areas, 1977 to 2008



Source: See Appendix.

# Methods

## DATA SOURCES

**MORTALITY DATA:** The Compulsory Inspection (CI) database for 1977 to 2008 was acquired from the Fish and Wildlife Branch of the B.C. Ministry of Environment (MOE) on April 30, 2009. The CI database was the source of all grizzly bear mortality data used in this report.

Compulsory Inspection data for 2009 were acquired on February 4, 2010, and are only included in counts of total grizzly mortality and total hunter kills. All maps of grizzly mortality were created using UTM coordinate and location name information for every grizzly mortality record in the CI database, and shapefiles downloaded from the GeoBC Data Discovery Service before July 16, 2009.<sup>59</sup>

**POPULATION DATA:** We used grizzly bear population estimates from the 2008 Grizzly Bear Population Estimate<sup>60</sup> and from results in Proctor et al. 2007.<sup>61</sup> Six of these numbers are revisions of population estimates from 2004, updated by the B.C. MOE in 2008.<sup>62</sup> Revisions made by Proctor et al. 2007 to two additional GBPU in 2007 that were not reflected in the revised 2008 population estimates of the B.C. MOE were used for this report instead of B.C. MOE's 2008 estimates for those GBPU.<sup>63</sup>

It should be noted that we used 2007/2008 revised population estimates for all analyses of all mortality data between the years 2004 and 2008, not 2004 population estimates.<sup>64</sup>

**ALLOWABLE HUMAN-CAUSED MORTALITY RATES:** Allowable human-caused mortality (HCM) rates were obtained from Austin et al. 2004.<sup>65</sup> Although the allowable HCM rates in Austin et al. 2004 were applied by BC MOE to a three-year allocation period between 2004 and 2006, analyses for this report applied these rates to each year between 2004 and 2008, treating the allowable HCM rate as an annual maximum. Grizzly harvest allocation now takes place over five-year periods.<sup>66</sup>

Any GBPU named in this report as experiencing human-caused mortality that exceeds the allowable HCM rate did so in at least one, and up to five years between 2004 and 2008.

## ANALYSES

Total mortality for all bears in each GBPU for each of five years (2004-2008) was taken from the CI database and then apportioned among the different causes: hunting kills in protected areas, hunting kills outside protected areas, and other mortality. Each of these was expressed as a percentage of the estimated population size, and compared with the allowable HCM rate.<sup>67</sup> Because each mortality estimate for a GBPU is based on the estimated population size, mortality rates can be added across causes and compared directly to the allowable HCM rates. All rates are sensitive to GBPU population estimates, and these estimates undergo regular revision.<sup>68</sup> For all our analyses, we used grizzly bear population estimates and allowable HCM rates found in the following table. Results broken down by year are available at [www.davidsuzuki.org/publications/reports/grizzlies-appendix-02/](http://www.davidsuzuki.org/publications/reports/grizzlies-appendix-02/) (pdf).

Grizzly Bear Population Unit	2008 Grizzly Bear Population Estimate	Allowable Human-caused Mortality Rate (percentage)
Alta	133	2.8
Babine	286*	3.5
Blackwater-West Chilcotin	193	0.0
Bulkley Lakes	407	2.3
Cassiar	730	3.5
Central Monashee	143	2.3
Central Purcell	86*	3.0
Central Rockies	173*	3.6
Central Selkirk	178	3.0
Columbia-Shuswap	396	2.9
Cranberry	341	3.5
Edziza-Lower Stikine	371	3.6
Finlay-Ospika	689	3.6
Flathead	151	2.3
Francois	140	2.1
Garibaldi-Pitt	18	0.0
Hart	386	2.4
Hyland	326	3.4
Kettle-Granby	81	0.0
Khutzymateen	376	3.6
Kingcome-Wakeman	230	4.1
Kitlope-Fiordland	346	4.0
Klinaklini-Homathko	109	0.1
Knight-Bute	186	3.3
Kwatna-Owikenno	316	3.9
Moberly	174	2.9
Muskwa	774	3.6
Nation	241*	2.5
North Cascades	23	0.0
North Coast	214	3.2
North Purcell	228	3.8
North Selkirk	264	3.8
Nulki	192	0.0
Omineca	481*	3.4
Parsnip	473	3.7
Quesnel Lake North	317	3.4
Robson	631*	3.2
Rockies Park Ranges	164	3.0
Rocky	730	2.6
South Chilcotin Ranges	104	0.0
South Purcell	92**	2.0
South Rockies	304	4.0
South Selkirk	58	0.0
Spatsizi	540	3.7
Spillamacheen	141	3.0
Squamish-Lillooet	56	0.0
Stein-Nahatlatch	61	0.0
Stewart	319	3.7
Taiga	92	0.0
Taku	595	3.4
Tatshenshini	360	3.4
Toba-Bute	75	0.0
Tweedsmuir	279	2.8
Upper Skeena-Nass	661	4.1
Valhalla	96	0.0
Wells Gray	374	3.2
Yahk	20**	0.0
Total	15,924	

\*Population estimates revised from the 2004 Grizzly Bear Population Estimate by the BC M0E in 2008.

\*\*Population estimates from Proctor et al. 2007 that were not reflected in the 2008 M0E Grizzly Bear population Estimate.

Results by year  
are available at  
[www.davidsuzuki.org/publications/reports/grizzlies-appendix-02/](http://www.davidsuzuki.org/publications/reports/grizzlies-appendix-02/) (pdf).



## NOTES

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- 9 Hamilton 2008, supra note 7.
- 10 Hamilton and Austin 2003, supra note 6.
- 11 British Columbia Ministry of Environment, Lands and Parks (MELP.) 1995(a). *Conservation of grizzly bears in British Columbia*. Background report. 70 pp.
- 12 Gyug, L., A. Hamilton and M. Austin. 2004. Grizzly Bear (*Ursus arctos*). *Accounts and Measures for Managing Identified Wildlife – Accounts V*. 2004.  
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- 13 BCMELP 1995(a), supra note 11.  
Horejsi et al. 1998, supra note 8.
- 14 The total number of grizzlies killed by humans between 1977 and 2009 is 10,811, with legal hunter kills accounting for 9,484 of those mortalities. In this report, any analyses of grizzly mortality by population unit do not include 2009 grizzly mortality.
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- 18 British Columbia Ministry of Environment, Lands and Parks (MELP.) 1995(b). *A Future for the Grizzly: British Columbia Grizzly Bear Conservation Strategy*.
- 19 Gilbert, B., L. Craighead, B. Horejsi, P. Paquet, W. McCrory. 2004. *Scientific Criteria for Evaluation and Establishment of Grizzly Bear Management Areas in British Columbia*. Panel of Independent Scientists, Victoria, BC. 16pp.
- 20 Hamilton and Austin 2003 supra note 6.
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Dauphine et al. 2001, supra note 8.  
Boulanger and Hamilton 2001, supra note 8.  
McLoughlin 2002, supra note 8.
- 22 Hamilton and Austin 2003, supra note 6.

- 23 In this report “protected area” includes all classes of park, conservancy, recreation area and ecological reserve.
- 24 Not all parks allow the trophy hunting of grizzly bears. The percentage of parks open to hunting of some wildlife as of March 2009 is 65% [532/821], from the *Park Act* Conservancy and Recreation Regulation, Schedule B. Use of Hunting Weapons in Parks, Conservancies and Recreation Areas, at [http://www.bclaws.ca/Recon/document/freeside/-%20p%20--/17\\_park%20act%20sbc%201996%20c.%20344/05\\_regulations/13\\_180\\_90%20park%20conservancy%20and%20recreation%20area%20regulation/180\\_90\\_03.xml](http://www.bclaws.ca/Recon/document/freeside/-%20p%20--/17_park%20act%20sbc%201996%20c.%20344/05_regulations/13_180_90%20park%20conservancy%20and%20recreation%20area%20regulation/180_90_03.xml)  
  
Federally managed national parks in B.C. prohibit the hunting of all animals, including grizzly bears. These include Yoho, Kootenay, Revelstoke, and Glacier national parks.
- 25 Gyug et al. 2004, supra note 12.
- 26 We have only used mortality data from 2004 to 2008 to conduct this analysis because this is the period for which the provincial government’s current population estimates are valid. See *Appendix: Methods and Sources* for how this analysis was done.
- 27 McLoughlin 2002, supra note 8.
- 28 Harris, R.B. 1986. Modeling sustainable harvest rates for grizzly bears. Pp. 268-279 in *The Grizzly Bear in Northwest Montana*, Final Programmatic Environmental Impact Assessment, Mont. Dept. Fish, Wildlife and Parks, Helena, MT.  
  
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- 29 Hamilton and Austin 2003, supra note 6.
- 30 Ibid.
- 31 The B.C. government manages both total and female mortality levels by GBPU over five-year allocation periods (B.C. MELP 2007, supra note 66). If either the total or female limit is exceeded during an allocation period, the hunting season is closed for the remainder of the allocation period, and any mortality in excess of either the total or female limit at the end of an allocation period is deducted from the limit available in the following allocation period. For more detailed information about how the annual grizzly bear harvest is calculated, see Hamilton and Austin 2003 (supra note 6) and Austin et al. 2004 (supra note 65).
- 32 Although female mortality rates are not discussed at length in this report, Map 3 shows five GBPUs in addition to the 12 listed in Figure 3 where actual female mortality rates exceeded allowable limits in at least one year between 2004 and 2008. Those GBPUs are Tatshenshini, Hyland, Cranberry, Robson and Edziza-Lower Stikine.
- 33 The period of time for which the government has relatively accurate population estimates and detailed mortality data.
- 34 Please see Appendices 1 and 2 for methods and results.
- 35 McLoughlin 2002 supra note 8.  
Horejsi et al. 1998, supra note 8.  
Grizzly Bear Scientific Advisory Committee 1998, supra note 8.
- 36 McLoughlin 2002, supra note 8.
- 37 Hamilton 2008, supra note 7.
- 38 Hamilton A.N. Personal communication, September 2009.
- 39 Hamilton 2008, supra note 7.
- 40 Horejsi et al. 1998, supra note 8.  
McLoughlin 2002, supra note 8.
- 41 Gilbert et al. 2004, supra note 19.
- 42 Powell, R.A., J.W. Zimmerman, D.E. Seaman and J.F. Gilliam, J.F. 1996. Demographic Analyses of a Hunted Black Bear Population with Access to a Refuge. *Conservation Biology* 10 [1]: 224-234.
- 43 Ibid.
- 44 The Greater Yellowstone Area Distinct Population Segment was removed from the list of species protected by the Endangered Species Act in 2007 and re-listed in 2009. For more information about grizzlies in the U.S. see the U.S. Fish and Wildlife Service species profile at <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A001>
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- 50 Ibid.
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- 59 Available at <http://geobc.gov.bc.ca/>. These shapefiles include base maps, grizzly bear population units, and parks and protected areas.
- 60 2008 Grizzly Bear Population Estimate for British Columbia [http://www.env.gov.bc.ca/wld/documents/gbcs/2008\\_Grizzly\\_Population\\_Estimate\\_final.pdf](http://www.env.gov.bc.ca/wld/documents/gbcs/2008_Grizzly_Population_Estimate_final.pdf)
- 61 Proctor, M., J. Boulanger, S. Nielsen, C. Servheen, W. Kasworm, T. Radandt, and D. Paetkau. 2007. *Abundance and density of Central Purcell, South Purcell, Yahk, and South Selkirk Grizzly Bear Population Units in southeast British Columbia*. B.C. Ministry of Environment. Nelson. BC. 30pp.
- 62 The 2004 Grizzly Bear Population Estimate for British Columbia is available at [http://www.llbc.leg.bc.ca/public/PubDocs/bcdocs/373348/gb\\_bc\\_pop\\_est.pdf](http://www.llbc.leg.bc.ca/public/PubDocs/bcdocs/373348/gb_bc_pop_est.pdf). The population estimates from 2004 of the following GBPU's were revised in 2008: Babine 487, Central Purcell 150, Central Rockies 235, Nation 484, Omineca 726, Robson 689.
- 63 In the 2008 Grizzly Bear Population Estimate, the South Purcell and Yahk population units were 158 and 44, but we used the revised numbers of Proctor et al. (2007, supra note 61) to be consistent with the B.C. MOE's updated 2008 estimates from other revised population units (Central Purcell and South Selkirk) that were changed to reflect Proctor et al.'s (2007) results.
- 64 In all cases where GBPU population estimates were adjusted by the B.C. MOE in 2007/2008, the previous population estimates from 2004 were higher. Our actual human-caused mortality rate results for GBPU's with revised 2007/2008 population estimates would have been lower if we had used 2004 population estimates for those GBPU's (Babine, Central Purcell, Central Rockies, Nation, Omineca, and Robson) in this report.
- 65 Austin, M.A., D.C. Heard, and A.N. Hamilton. 2004. *Grizzly Bear (*Ursus arctos*) Harvest Management in British Columbia*. B.C. Ministry of Water, Land and Air Protection, Victoria, BC. 9pp.
- Can be found at [http://www.env.gov.bc.ca/wld/documents/gb\\_harvest\\_mgmt.pdf](http://www.env.gov.bc.ca/wld/documents/gb_harvest_mgmt.pdf). See Appendix 3. Calculations of Allowable Known Human-caused Mortality Levels by Grizzly Bear Population Unit.
- According to Harris (1986, supra note 28), an acceptable annual mortality rate for females is 30% of the total allowable mortality rate. Since the allowable mortality rate in B.C. varies by GBPU and falls between 0.0% and 4.1%, allowable female mortality should fall between 0.0% and 1.2%. For this analysis, we derived allowable female mortality by using 30% of the allowable HCM rates from Austin et al. 2004.
- 66 B.C. Ministry of Environment, Lands and Parks. 2007. *Grizzly Bear Harvest Management Procedure Manual*. Available at [http://www.env.gov.bc.ca/wld/documents/grizzlybear\\_harvest\\_mgmt\\_proc\\_2007.pdf](http://www.env.gov.bc.ca/wld/documents/grizzlybear_harvest_mgmt_proc_2007.pdf)
- 67 Calculations were as follows:
- Human-caused mortality
- In the Spatsizi GBPU in 2005 seven grizzlies were hunted within a protected area (two in Stikine River Park and five in Spatsizi Plateau Wilderness Park). The grizzly population estimate for the Spatsizi GBPU is 540 bears. The rate of bears hunted in protected areas in this GBPU in 2005 is 1.2% ( $7 \times 100 / 540 = 1.2$ ).
- In 2008 19 grizzlies were killed by humans within the Tweedsmuir GBPU. The population estimate for the Tweedsmuir GBPU is 279 bears. The actual human-caused mortality rate in this GBPU in 2008 is 6.8% ( $19 \times 100 / 279 = 6.8$ ).
- Relative rate of loss
- In the Central Purcell GBPU in 2004, the rate of hunter kills was 5.8%. The allowable HCM rate for this GBPU is 3%. In this GBPU in 2004, the allowable rate of mortality is exceeded by 93.3% ( $5.8 - 3.0 \times 100 / 3.0 = 93.3$ ).
- Conversion of rates to number of bears
- In the Central Rockies GBPU in 2008, 10 bears were killed by hunters. The estimated population of this GBPU is 173 and the total allowable HCM rate is 3.6%. The number of bears that are allowed to die annually in the Central Rockies GBPU is 6.2 ( $3.6 / 100 \times 173 = 6.2$ ). This number was truncated to six bears allowed to die given the allowable HCM rate.
- 68 Hamilton 2008, supra note 7.





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