



# **A GRIZZLY CHALLENGE**

Ensuring a Future for Alberta's Threatened Grizzlies

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Written by Jeff Gailus, M.Sc.

## ACKNOWLEDGEMENTS

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Written by Jeff Gailus, M.Sc., for the Alberta Wilderness Association, the Canadian Parks and Wilderness Society – Southern Alberta Chapter, the David Suzuki Foundation, the Natural Resources Defense Council, the WildCanada Conservation Alliance, the Yellowstone to Yukon Conservation Initiative, and the Sierra Club of Canada.

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**Steven Cretney**, communication designer, [www.theforest.ca](http://www.theforest.ca)

**Nigel Douglas**, Conservation Specialist, Alberta Wilderness Association

**Sarah Elmeligi**, Senior Conservation Planner, Canadian Parks and Wilderness Society – Southern Alberta Chapter

**Wendy Francis**, Director, Conservation Science and Action, Yellowstone to Yukon Conservation Initiative

**John Marriott**, professional photographer, [www.wildernessprints.com](http://www.wildernessprints.com)

**Wayne McCrory**, RPBio. Bear biologist. Valhalla Wilderness Society

**Faisal Moola**, Science Director, David Suzuki Foundation

**Carl Morrison**, Action Grizzly Bear Campaigner, Sierra Club of Canada

**Diane Pachal**, Alberta Wilderness Director, Sierra Club of Canada

**Paul Papin**, PhD

**Jim Pissot**, WildCanada Conservation Alliance

**Dave Poulton**

**Florian Schulz**, professional photographer, [www.visionsofthewild.com](http://www.visionsofthewild.com)

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Alberta contains one of the most threatened grizzly bear populations in North America.

Photo John E. Marriott,  
wildernessprints.com

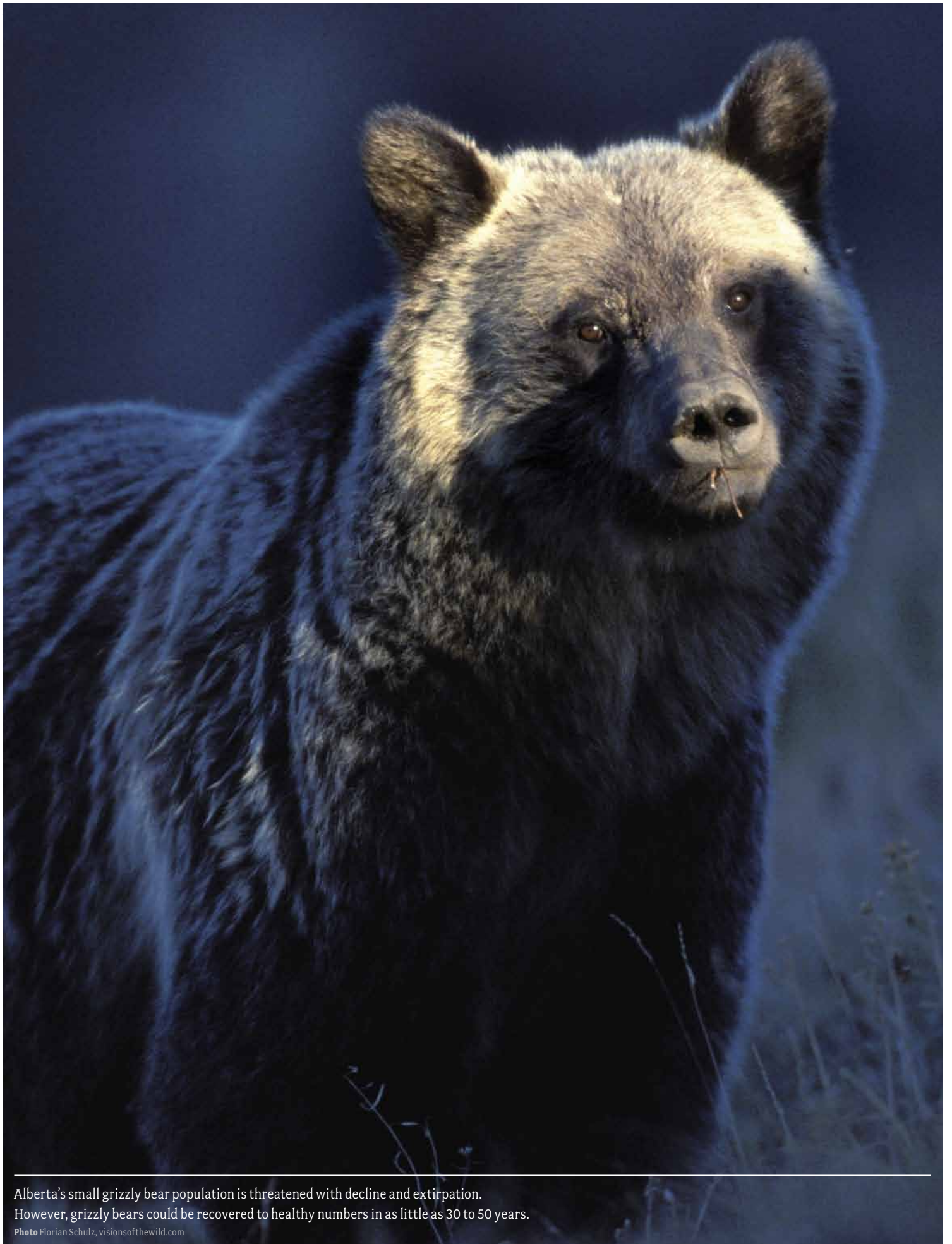


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Alberta's small grizzly bear population is threatened with decline and extirpation. However, grizzly bears could be recovered to healthy numbers in as little as 30 to 50 years.

Photo Florian Schulz, [visionsofthewild.com](http://visionsofthewild.com)

In Alberta, grizzly bear cubs stay with their mothers for two to six years.

Photo John E. Marriott,  
wildernessprints.com



## EXECUTIVE SUMMARY

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The future of Alberta's grizzly bears has been of significant concern for many Albertans for at least two decades. Recent research, summarized in the Government of *Alberta's 2010 Status of the Grizzly Bear in Alberta* report, indicates that the grizzly bear population in Alberta is in dire straits. Alberta's grizzly bear population, which occurs on both provincial and federal lands, is small (760) and becoming increasingly fragmented into even smaller population units, many of which are fewer than 100 individuals. Mortality rates are unsustainably high, and populations in many parts of Alberta are declining.

The future for grizzly bears in this province appears to be equally uncertain. Industrial activity and the road networks required to harvest timber and extract oil and gas are expected to increase dramatically in grizzly bear habitat, as are motorized recreation, and urban and agriculture development. The outlook for Alberta's bears under current conditions is a 98.6 per cent risk of population decline by 30 per cent or more over the next 36 years.

Thankfully, experience in other jurisdictions provides an inspiring example of what can be accomplished to restore grizzly bear numbers to healthy levels. Over the last 25 years, concerted efforts in the Greater Yellowstone Ecosystem (Montana, Wyoming and Idaho) have recovered grizzly bears from approximately 200 individuals to 600; in the Northern Continental Divide Ecosystem, an estimated 800 grizzly bears roam northwest Montana just south of the Alberta border. Such success is the result of strong legislation, committed leadership at the highest levels of government, cooperation among multiple jurisdictions, and the long-term commitment of adequate funding.

Volumes of scientific research and experiences in Alberta, the United States and elsewhere prove that the key to recovering at-risk grizzly bear populations is to reduce the likelihood of people and bears coming into close contact with each other. The primary way to achieve this is to limit the number of roads in grizzly bear habitat. Attempting to prevent the use of existing road networks, even those officially closed by gates, signage and regulations, has proven ineffective. The solution is clear: maintain large, unroaded wilderness areas and reduce road densities in the rest of grizzly bear habitat to a sustainable level of 0.6 kilometres per square kilometre.

Alberta's grizzly bear recovery plan was painstakingly drafted by a team of committed citizens from a variety of sectors and approved by the Alberta government in 2008. Although this plan points us in the right

direction, it does not go far enough to protect Alberta's grizzly bear populations from further decline. Proposed human-caused mortality limits are too high, and the universally accepted sustainable road density thresholds do not apply to enough of Alberta's grizzly bear recovery area to ensure that bear populations can recover to sustainable levels.

Even more troubling, the provincial government seems to have reduced the size of the recovery area stipulated in the recovery plan, shrinking the area that will be able to support grizzly bears. Recent evidence also suggests that the government is not enforcing the recommendations and guidelines laid out in the grizzly bear recovery plan. Even with the adoption of the inadequate recovery plan, Alberta Sustainable Resource Development has approved, renewed or amended several forest management plans in important grizzly bear habitat that do not meet the requirements of the recovery plan and put grizzly bears at even greater risk of decline.

The good news is that there is still time to pull Alberta's grizzly bear population back from the brink, just as our American neighbours have done. If the recovery plan is updated and improved to include the new information and analysis in the government's recent status report, and if the Alberta government implements the recovery plan in an open and transparent manner, there is no reason why Alberta cannot recover a "viable and self-sustaining" population of approximately 2000 grizzly bears.

Alberta's ongoing Land-Use Framework process provides an ideal opportunity to include the management strategies from a new and improved grizzly bear recovery plan into all relevant regional plans. Currently, the South Saskatchewan and Athabasca regional planning processes are underway. The Red Deer, North Saskatchewan, Upper Athabasca and Upper Peace regional plans also will provide an opportunity to better address grizzly bear habitat needs. If these plans strictly limit road densities and provide adequate habitat security for grizzly bears (including large core, roadless areas) across their current range, they will secure a future for grizzly bears — and at the same time protect other natural resources that Albertans value, including clean drinking water, healthy fisheries and abundant game species.

If the Alberta government isn't up to the task, the federal government will have no choice but to invoke the safety-net clause in Canada's Species at Risk Act and step in to protect Alberta's most threatened grizzly bear population units.



## INTRODUCTION

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The Government of Alberta is responsible for safeguarding the eastern edge of Canada's grizzly bear population.



About 6000 grizzly bears once roamed almost all of Alberta.  
Today, less than 800 inhabit only Alberta's western mountains and foothills.  
Photo Florian Schulz, visionsofthewild.com

Grizzly bears once roamed as far east as Manitoba and as far south as Mexico, but they have been beaten back into the less accessible regions of the mountainous West and North over the last 200 years (See Map 1). Habitat loss and widespread killing resulted in significant reductions in the size and distribution of grizzly bear populations across North America. Extensive agricultural land conversion and unrestricted hunting, including predator control, were the primary reasons for these declines.<sup>1</sup> Decisions made in Alberta today will determine whether or not this westward wave of extirpation will continue.

Before the arrival of European explorers, an estimated six thousand grizzly bears occupied almost all of Alberta. Historical records indicate they were abundant in many areas of the province, including the prairies, the Cypress Hills, and the lower elevation reaches of the Bow, North and South Saskatchewan, and Peace rivers.<sup>2</sup> The arrival of large numbers of explorers and fur traders armed with increasingly lethal rifles resulted in a significant decline in grizzly bear numbers.

Today, grizzly bears range across most of the western third of the province (see Map 2), though recent research indicates that the population is small and likely shrinking.<sup>3</sup> The primary reason for the continued decline of Alberta's grizzly bear population is human-caused mortality associated with expanding road access, habitat loss and alienation, and human-bear conflicts associated with hunting, agriculture and residential development.<sup>4</sup>

Using publicly available information, this report explains the current status of Alberta's grizzly bear population and assesses current efforts to prevent its decline and, ultimately, recover it to sustainable levels. It also provides a science-based vision that can prevent further declines and set Alberta on the path to recovering a healthy, self-sustaining grizzly bear population that will remain part of Alberta's natural and cultural heritage for centuries.

Grizzly bears are “ecosystem engineers” that help to maintain healthy forests and watersheds.

Photo Florian Schulz,  
visionsofthewild.com



## GRIZZLY BEAR BASICS

Most biologists 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 (such as elk and deer) and propagate plant species such as blueberry and buffaloberry. They help to maintain plant and forest health by dispersing plant seeds and aerating the soil as they dig for roots, pine nuts and ground squirrels.<sup>5</sup>

Their large home ranges also make them an “umbrella” species. Managing the landscape for grizzly bear population health also helps to maintain abundant populations of many other species, healthy aquatic ecosystems and fisheries, and clean and abundant supplies of water for downstream users.<sup>6</sup> One estimate indicates that by protecting grizzly bears in the Central Canadian Rockies, approximately 400 terrestrial vertebrate species will also be protected.

“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 efforts in North America. “Where viable populations of grizzly bears persist, the landscape is being managed sustainably.”<sup>7</sup>

However, it is difficult for grizzly bears to survive where humans are plentiful. Grizzly bear biology makes them extremely susceptible to local and regional population declines, largely because they have low reproductive rates and low dispersal capabilities.<sup>8</sup> These factors mean that even small numbers of human-caused grizzly bear mortalities can result in rapid population decline.

**Map 1** Grizzly Bear Range in North America



Likewise, at-risk grizzly bear populations take a long time to recover even after they have been protected.<sup>9</sup> Populations decline when there are high numbers of adult mortalities, especially females, while population recovery relies on the production and long-term survival of cubs. Even under the best conditions, the natural growth rate of grizzly bear populations rarely exceeds eight per cent per year.<sup>11</sup>

Minimizing human-caused mortality, especially of females, is the key to grizzly bear management and recovery.<sup>12</sup> This is particularly critical for small populations of 100 individuals or less.<sup>13</sup>

### Human-caused grizzly bear mortality

Human-caused mortality is the greatest source of mortality for grizzly bears and is the primary factor limiting grizzly bear populations.<sup>14</sup> An analysis of 13 different studies indicates that 77 to 85 per cent of radio-collared grizzly bears died at the hands of humans.<sup>15</sup> Other research indicates that between 17 and 54 per cent of human-caused grizzly bear mortalities remain unreported.<sup>16</sup>

Sustainable levels of human-caused mortality, which allow for population recovery and long-term persistence, range from 2.8 per cent to 4.9 per cent.<sup>17</sup> Grizzly bear populations in productive habitat and/or with high reproductive rates can withstand 4.9 per cent annual human-caused mortality. However, populations in moderate habitat and/or with low reproductive rates (which includes much of Alberta) can only withstand human-caused mortality rates of 2.8 per cent or less. Mortality rates of females, which are the reproductive engines of any population, should not exceed 30 per cent of the approved mortality threshold.<sup>18</sup>

Experiences in Sweden and other parts of western North America indicate that human-caused grizzly bear mortality can be reduced sufficiently to allow grizzly bear populations to recover.<sup>19</sup> Threatened grizzly bear populations have increased substantially in the Yellowstone<sup>20</sup> and Northern Continental Divide<sup>21</sup> recovery areas following the implementation of policies to reduce motorized access in grizzly bear habitat and, therefore, the chances of human-induced mortality.<sup>22</sup>





Grizzly bear populations cannot survive in areas where road densities are high. Only ~23 grizzlies remain in the Swan Hills (bottom), which is riddled with roads, cut blocks, and well sites.

**Photo 1** Global Forest Watch Canada

**Photo 2** John E. Marriott, wildernessprints.com

**Photo 3** USGS/Land Remote Sensing Program

## Grizzly bears and roads don't mix

According to Alberta's 2010 grizzly bear status report, habitat alteration and road building by forestry, mining and hydrocarbon development cause declines in grizzly bear numbers.<sup>23</sup> Increased human access to grizzly bear habitat leads to mortality caused by poaching, self-defence kills, hunters mistakenly shooting grizzlies instead of black bears, and wildlife-vehicle collisions. Increased access can also displace grizzly bears from high-quality habitat, thus potentially impacting their ability to meet their individual resource requirements.<sup>24</sup> In addition, grizzly bear mortality can be caused by the relocation or destruction of so-called "problem" bears.<sup>25</sup>

In the Alberta portion of the Central Rockies Ecosystem, 89 per cent of human-caused grizzly mortalities occurred within 500 metres of a road on provincial lands, and 100 per cent of human-caused mortalities occurred within 200 metres of a trail in national parks.<sup>26</sup> On the northern East Slopes of Alberta, grizzly bear survival rates decreased with increasing densities of "open routes"<sup>i</sup> that allow motorized access.<sup>27</sup> Because female grizzly bears spend more time close to roads than males, they are subject to a higher level of mortality.<sup>28</sup> Numerous other studies also have found that human-caused mortality, including hunting, most often occurs near roads.<sup>29</sup> The weight of evidence suggests that areas with high open-route densities cannot sustain populations of grizzly bears. As the proportion of altered habitat increases, mortality rates inevitably increase.<sup>30</sup>

Although clear cuts can provide additional food resources for grizzly bears, some bears still avoid these artificial openings, and they typically remain accessible to motorized vehicles, especially ATVs, after forestry operations end. This means bears in these areas are at higher risk of encountering and being killed by humans.<sup>31</sup> Even temporary logging roads often stay open for a minimum of five years before being reclaimed.<sup>32</sup> Any benefits in improved food resources from clear-cut forestry are outweighed by increased mortality risks associated with forestry roads. In fact, clear cuts tend to become population sinks for grizzly bears and are incompatible with grizzly bear recovery and persistence.<sup>33</sup>

Even within protected areas such as national or provincial parks, motorized access and other human activity (e.g., high levels of non-motorized human use of hiking trails) lead to human-caused grizzly bear deaths.<sup>34</sup> These activities displace grizzly bears from preferred habitats and increase grizzly bear habituation, which can lead to increases in the human-bear conflicts that eventually lead to grizzly bear mortality.

Experience has shown that unsustainable levels of human-caused grizzly bear mortality can be prevented by limiting the number of roads and trails built into grizzly bear habitat.<sup>35</sup> In areas that are already heavily roaded, excessive rates of bear mortality can be reduced only by effectively reclaiming roads so that motorized access is prevented.<sup>36</sup>

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<sup>i</sup> "Open routes" include roads, cutlines, seismic lines and any other trail that provides motorized access into grizzly bear habitat by two- or four-wheel vehicles.



Busy highways make it difficult for grizzly bears to disperse, and to find mates and food.

Photo John E. Marriott,  
wildernessprints.com



## Grizzly bears need habitat security

One of the most effective strategies for grizzly bear conservation is to maintain or restore adequate levels of grizzly bear habitat security.<sup>37</sup> Adequate levels of habitat security reduce the number of human-bear encounters and, as a result, human-caused bear mortalities.

Secure habitat is defined as being more than 500 metres from an open motorized access route or a trail that sees high levels of non-motorized human use (greater than 20 parties/week).<sup>38</sup> Secure habitat must also be a minimum of 10 sq. km.<sup>39</sup> These characteristics reduce the likelihood that bears will encounter, and therefore be killed by, people. Secure habitats do not contain open motorized access routes, though they can include roads and non-motorized trails that have been decommissioned, obliterated, or made impassable by permanent barriers (but not gates).<sup>40</sup>

The amount of secure habitat required to protect grizzly bears ranges from 55 to 68 per cent of a given management or recovery area.<sup>41</sup> However, high mortality rates, the relatively low productivity of grizzly bear habitat in Alberta, low reproductive rates in much of the population, and low densities in some population units suggest that habitat-security targets should be set at the highest end of this scale.

Although recovery areas must be sufficiently large to support sustainable grizzly bear populations (i.e. thousands of square kilometres), the scientific literature suggests that habitat security must be measured at a much finer scale to ensure adequate protection for grizzly bears. Ideally, habitat security should be measured at the scale of an average female home range. In the Yellowstone grizzly bear recovery plan, habitat security was measured in units of approximately 200-300 sq. km.<sup>42</sup>

Maintaining adequate levels of habitat security based on open-road densities is used widely in U.S. grizzly bear recovery efforts, particularly the Yellowstone and Northern Continental Divide ecosystems. For instance, the open-route density threshold in the Greater Yellowstone Grizzly Bear Recovery Area is 0.6 km/sq. km., and the total (open and closed) route-density threshold is 1.2 km/sq. km. Only approximately 10.5 per cent of the Yellowstone recovery area, which has seen the grizzly bear population triple since it was listed as a threatened species in 1982, has open-route densities greater than 0.6 km/sq. km. This has allowed the Yellowstone recovery area to maintain 85.6 per cent secure habitat.<sup>43</sup> Grizzly bears have increased substantially in the Yellowstone<sup>44</sup> and Northern Continental Divide<sup>45</sup> recovery areas using these criteria.

## The problem with habitat fragmentation

The loss and fragmentation of habitat has been widely acknowledged as a primary cause of species decline worldwide.<sup>46</sup> Habitat fragmentation occurs when portions of a given landscape are transformed or destroyed by natural processes or human activities, reducing the total amount of habitat and creating isolated habitat patches.<sup>47</sup> This process is harmful because it can lead to smaller and more isolated populations, which become more vulnerable to local extinction due to extreme events such as fire, disease, and human-induced mortality, and to the negative effects of inbreeding depression.<sup>48</sup> The more fragmented the habitat, the more likely that species will be negatively impacted.

Habitat alteration and fragmentation result primarily from human activities, including resource extraction (e.g., coal, oil, gas, mining, and forestry), agriculture, energy generation and transmission, recreational activities, and settlement.<sup>49</sup> Grizzly bears may be affected directly through removal or degradation of suitable habitat, or indirectly by avoiding human activities and changes on the landscape.<sup>50</sup> The extent to which these pressures affect grizzly bear populations will depend on the degree to which management interventions are successful at limiting mortality risk and habitat alienation for grizzly bears.<sup>51</sup>

Even inside national and provincial parks, undisturbed habitat is shrinking and grizzly bears are displaced by interactions with humans and associated development.<sup>52</sup> Roads and trails lead to habitat avoidance and grizzly bear mortality.<sup>53</sup>

Roads and other types of habitat degradation can reduce the movement of bears to the point that it influences the genetic composition within and among grizzly bear populations. Populations may become isolated when they are no longer able to move freely across the landscape and interact with each other as they once did.<sup>54</sup>

Grizzly bears, especially adult females, are reluctant to cross highways, which can become barriers to gene flow and demographic rescue.<sup>55</sup> In concert with other geographic factors, such as major water bodies, rivers, and rugged mountain ranges, unmitigated highways can result in population isolation and decline.

In the short term, habitat loss and fragmentation can lead to poorer nutrition, lower reproductive rates, and higher levels of human-bear conflict and human-caused mortalities. In the long term, habitat loss and fragmentation lead to decreased population health and population decline.<sup>56</sup>



Grizzly bear population units of less than 125 individuals are very vulnerable to decline and disappearance.

Photo John E. Marriott, wildernessprints.com

## How many is enough?

Grizzly bear populations, like all wildlife, must be large and well-distributed enough to withstand the vagaries of things as accelerated climate change, large-scale habitat changes like fires and floods, and random mortality events like disease. Population goals should maximize the number of bears that can be expected to survive within the available space. This approach minimizes risk by achieving the maximum number of bears that can be supported by the available habitat. The greater the number of bears and the greater the extent of their geographic range, the lower the risk of decline and extirpation.<sup>57</sup>

History has shown that grizzly bear populations of less than 250 individuals are prone to decline and can rapidly reach a critically low threshold of 40-125 individuals.<sup>58</sup> Without dramatic intervention, populations of 40-125 bears are quite vulnerable to extinction.<sup>59</sup> Isolated populations of 50-90 bears have little chance for long-term viability without dramatic intervention involving recovery programs.<sup>60</sup>

Some scientific research suggests that grizzly bear population units should be at least 500-700 individuals to outlast the vagaries of catastrophic natural events, food availability and human behaviour and survive for hundreds of years.<sup>61</sup> The United States Fish and Wildlife Service considered the Yellowstone grizzly bear population to be sufficiently recovered to no longer require the protection of the U.S. *Endangered Species Act* when it reached 500 individual bears.<sup>62</sup>

Although it is impossible to know what the world will look like in several thousand years, it is likely to be quite different than it is today. Several thousand interacting individuals are required to maintain genetic diversity and population persistence over thousands of years.<sup>63</sup> This requires relatively frequent exchanges of individuals and genes among several population units. Evolutionarily Robust Populations, therefore, would be greater than 2000 individuals.<sup>64</sup>

The International Union for the Conservation of Nature (IUCN) guidelines, which Alberta uses to assess the status of endemic species, recommends that wildlife populations maintain more

than 1000 mature breeding adults to prevent unacceptable risk of decline. According to the IUCN, populations smaller than 1000 mature breeding adults should be listed and managed as “vulnerable” (“threatened” in Alberta), while populations with less than 250 mature breeding adults should be listed and managed as endangered.<sup>65</sup>

Only approximately 50 percent of any given grizzly bear population are mature breeding adults.<sup>66</sup> This means Alberta would need to support a minimum of 2000 grizzly bears to satisfy the IUCN criterion for a non-vulnerable population that both the federal and provincial government use to identify species at risk.

## Four Steps to Grizzly Bear Recovery

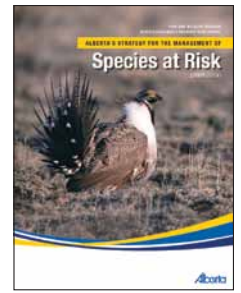
Successful grizzly bear recovery requires four things.

1. Limiting annual human-caused mortality to a rate that will allow grizzly bear populations to grow to a size and density that enables long-term persistence. Sustainable human-caused mortality rates range from 2.8 to 4.9 per cent, depending on habitat productivity and/or the population's reproductive rate.
2. Providing grizzly bear habitat security of between 55 to 68 per cent over an area large enough to maintain a grizzly bear population big enough for long-term persistence.
3. Limiting the density of roads and other routes across the recovery area to avoid unsustainable levels of motorized and non-motorized access.
4. Maintaining demographic connectivity between small population units by preventing the construction of, or mitigating the effects of, roads, highways, railroads and other sources of fragmentation in grizzly bear habitat.

Although it is not discussed in this report, successful grizzly bear recovery will require an effective and well-funded public-education program. This program should both build public support for grizzly bear recovery and help farmers, ranchers, hunters, hikers, mountain bikers, municipalities, and residents co-exist with grizzly bears. Such a program would reduce conflicts between bears and people (and thus reduce the likelihood of bears being relocated or killed) by teaching best practices for managing sources of attractants for bears, such as garbage, pet foods, beehives and fruit trees.

Grizzly recovery also will require a well-funded monitoring program that tracks the number and location of bear-human conflicts and human-caused mortalities. This will allow scientists and managers to track the size and health of the population over the long term and modify management and education strategies as needed.

Alberta's Strategy for the Management of Species at Risk (2009-2014) recognizes that wild species such as the grizzly bear contribute to the social and economic well-being of Albertans.



## GRIZZLY BEAR MANAGEMENT IN ALBERTA

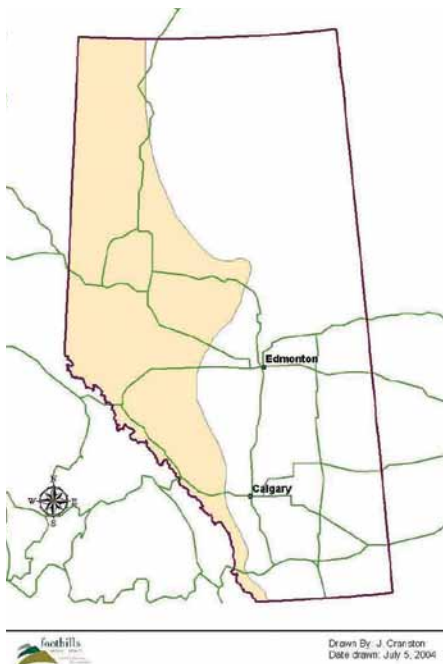
### Roles and Responsibilities

Except in national parks, Alberta's provincial government is solely responsible for managing wildlife and the habitat upon which it depends for the "long-term benefit and enjoyment of all Albertans".<sup>67</sup> Premier Ed Stelmach recently indicated that protecting the environment in Alberta is a "top priority" of his government, stating that the government will "ensure Alberta's energy resources are developed in an environmentally sustainable way."<sup>68</sup> The current Minister of Sustainable Development, Mel Knight, recently said that "the government of Alberta has every intention of being sure grizzly bears remain part of the landscape in Alberta."<sup>69</sup>

The *Wildlife Act* and the *Fish and Wildlife Policy for Alberta* (1982) are the primary policy tools guiding the management of grizzly bears and other wildlife in the province of Alberta. Section 3.1.1 of the *Fish and Wildlife Policy* states that "... the primary consideration of the Government is to ensure that wildlife populations are protected from severe decline and that viable populations are maintained."<sup>70</sup>

**Map 2** Current grizzly bear range and recovery area

Source: Alberta Grizzly Bear Recovery Plan (2008-2013).



The recently published *Strategy for the Management of Species at Risk* (2009-14) echoes the province's fish and wildlife policy, and adds that "Albertans want to know endangered species are being protected using our own laws and programs, without a need to turn to federal legislation.... Wild species are a keystone to healthy ecological processes providing environmental stability, with a subsequent benefit to the economic stability of the province and the social and economic well-being of Albertans. This keystone role is reflected in the high value that the large majority of citizens place on the conservation of species at risk." The goal of the strategy is to "ensure that populations of all wild species [in Alberta] are protected from severe decline and that viable populations are maintained, and where possible, restored."<sup>71</sup>

In 1996, Alberta signed the Accord for the Protection of Species at Risk in Canada (APSRC), which committed the provincial government to cooperate with the federal government on the conservation of species at risk. According to APSRC, where the balance of scientific information indicates a species is at risk, conservation and protective measures "will be taken."<sup>72</sup>

The formation of the Alberta Endangered Species Conservation Committee (AESCC) was one of the means by which Alberta agreed to meet its commitments under the accord.

Although Alberta's grizzly bear "May be at Risk" of extinction or extirpation according to the *General Status of Alberta Wild Species 2000*, it is managed as a big game species.<sup>73</sup> At the federal level, the status of grizzly bears in Canada was reviewed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2002. At that time, the "prairie population" was assessed as "extirpated, with no possibility of recovery," and the "northwestern population" (i.e. all grizzly bears extant in Canada) was assessed as "Special Concern." The reasons for this designation are familiar: the expansion of industrial, residential, and recreational development in grizzly bear habitat across western and northern Canada, habitat loss and population decline on the southern and eastern edge of its range, unsustainable human-caused mortality, and life history characteristics that make grizzly bears sensitive to human-caused mortality.<sup>74</sup>



Canada's Species at Risk Act (SARA) was passed in 2003. The "prairie" grizzly bear population is now listed under SARA, and a recovery plan has confirmed its designation as "extirpated, with no possibility of recovery." While the northwestern population is still listed as "special concern" by COSEWIC, it enjoys no legal protection under SARA, largely because the northwestern population is considered one large contiguous population of some 30,000 animals. However, COSEWIC recently began a reassessment of Canada's grizzly bear population, which it expects will be complete in April 2011.<sup>75</sup>

## A Short History of Grizzly Bear Management in Alberta

Albertans have been concerned about the health of the grizzly bear population for more than two decades. In 1988, the government estimated there were just 575 grizzly bears on provincial lands and a further 215 bears in the national parks of Banff, Jasper and Waterton.<sup>76</sup>

In response, the government published a grizzly bear management plan in 1990 that set a goal of increasing the grizzly bear population from 790 to 1000 bears.<sup>77</sup> The plan identified the "preservation and management of habitat" as the primary strategy for ensuring the "survival of the grizzly bear in Alberta."<sup>78</sup> The plan stipulated that this could be accomplished by restricting the type and intensity of industrial and other human uses, and by controlling public access.<sup>79</sup>

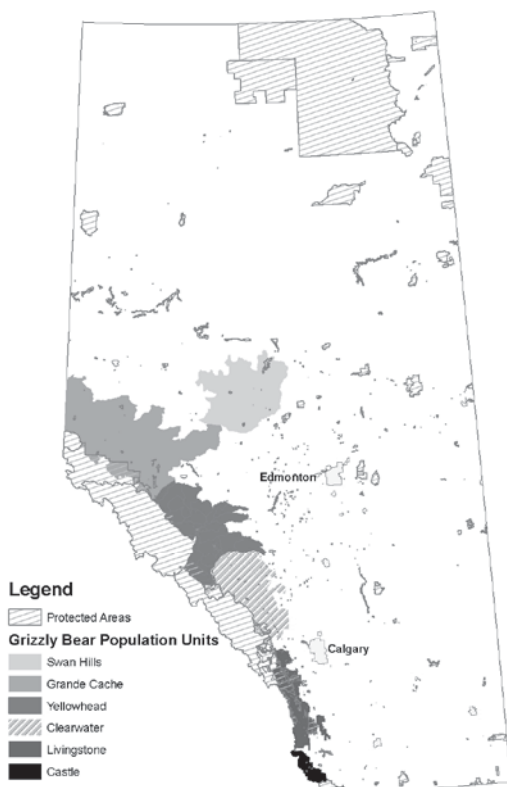
Although there is little evidence that any of the provisions in the 1990 grizzly bear management plan were actually implemented, by 1996 the government considered the grizzly bear population to be sustaining itself.<sup>80</sup> Indeed, the government's 2002 grizzly bear status report indicates that the population had increased from 790 to over 1000 bears.<sup>81</sup> However, subsequent analysis indicated that the methodology the government used to generate the 1988 and 2002 estimates involved "questionable practices" that "are not scientifically defensible", and which led to predictions that were "not biologically possible."<sup>82</sup>

The 2002 status report identified the same threats to grizzly bear persistence in Alberta as those highlighted in the 1990 management plan: habitat degradation and fragmentation, and human-caused mortality as a result of uncontrolled human access and various types of human activity.<sup>83</sup>

It is largely for these reasons that the Alberta Endangered Species Conservation Committee (AESCC) recommended in 2002 that grizzly bears be listed as *Threatened* under the *Wildlife Act*. The AESCC based its recommendation on the small population size (then thought to be ~700 individuals), slow reproductive rate, limited immigration from other populations, and increasing levels of human activity on the landscape.<sup>84</sup> Additional evidence suggests these conclusions were accurate.

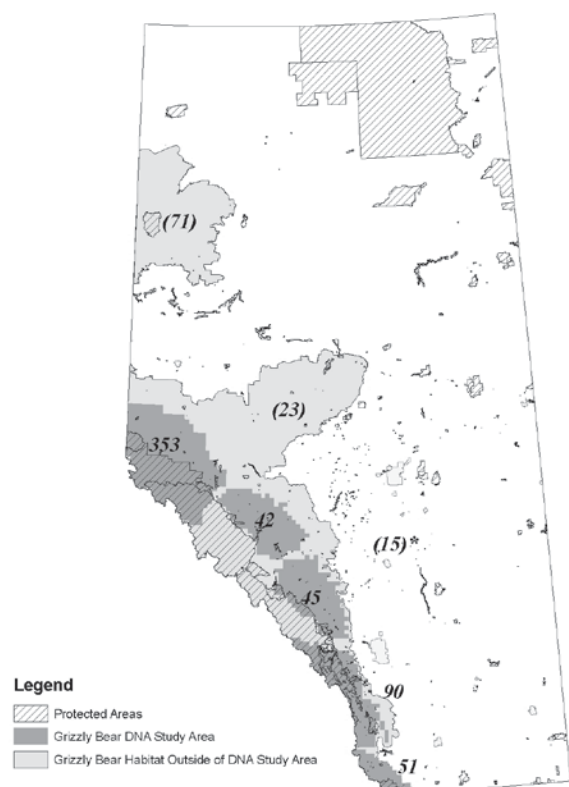
**Map3** The new, smaller grizzly bear population units (and recovery area) in Alberta.

Source Status of the Grizzly Bear in Alberta: Update 2010



**Map 4** Current Distribution of Grizzly Bears in Alberta

Source Status of the Grizzly Bear in Alberta: Update 2010



The Alberta government's *Status of the Grizzly Bear in Alberta: Update 2010* indicates that the grizzly bear population is small and likely declining.

Photo John E. Marriott,  
wildernessprints.com



The Alberta government did not accept the AESCC's 2002 recommendation, claiming that there was insufficient information on the size of the population.<sup>ii</sup> In response, the Ministry of Sustainable Resource Development invested \$3 million in an extensive, cutting-edge population estimate that experts have called one of the best in the world. The study, which was completed in 2009, estimates that there are approximately 691 grizzly bears in Alberta.<sup>85</sup> (An additional 70 grizzly bears are found in parts of Banff and Jasper national parks not included in this study<sup>86</sup>). Despite the fact this is approximately the same number that prompted the 2002 recommendation to list the grizzly as threatened, the Alberta government did not list the Alberta grizzly as a threatened species.

In 2004, the Alberta government formed a multi-stakeholder Grizzly Bear Recovery Team to draft a "recovery plan" for the grizzly bear population, even though it had not been listed as a threatened species. The recovery plan was submitted to the Minister of Sustainable Resource Development in December 2004, adopted by then Minister of Sustainable Resource Development Ted Morton in October 2007, and released to the public in March 2008.

In 2006, the Alberta government implemented a three-year suspension of the grizzly bear trophy hunt as it waited for the population estimate to be completed. This suspension has been maintained through 2010.

Despite the fact the recovery plan itself and the recently updated *Alberta's Strategy for the Management of Species at Risk* (2009 – 2014) advise that the recovery team be maintained to help guide and implement the plan it developed, Minister Morton promptly disbanded the Grizzly Bear Recovery Team shortly after the recovery plan was adopted. Although some aspects of the recovery plan have been implemented – mostly research – the Alberta government has not significantly funded and/or implemented the heart of the plan, which involves limiting and reducing roads and motorized access in grizzly bear habitat. The evidence to date suggests the government has little intention of doing so.

Despite compelling evidence to list the grizzly bear as threatened, Morton's written responses to letters submitted by concerned Albertans indicate that the priority for the government is to "begin the process of implementing one of the Plan's key remaining recommendations, namely to identify core grizzly bear habitats with low levels of motorized public access, and examine opportunities to maintain them in a condition that is conducive to the long-term support of grizzly bear populations."<sup>87</sup> The Alberta government designated core and secondary grizzly bear priority areas in 2008,<sup>88</sup> but the evidence indicates the government is not managing them according to the dictates of the recovery plan.

In February 2010, the Government of Alberta released *Status of the Grizzly Bear in Alberta: Update 2010*. Written by Dr. Marco Festa-Bianchet, the new status report added valuable new data, insight and analysis to the original 2002 status report. The 2010 update provides yet more evidence that the grizzly bear population in Alberta is small and likely declining.<sup>89</sup>

The status report was prepared, in part, to provide the Alberta's Endangered Species Conservation Committee with a comprehensive assessment that included new information that had become available since 2002. For the second time in nine years, the AESCC recommended that the Government of Alberta list Alberta's grizzly bear population as a threatened species under the *Wildlife Act*. Current Sustainable Resource Development Minister Mel Knight has stated that he will not make this decision alone, but rather take it to a Cabinet Committee for discussion.<sup>90</sup> He has not given a timeline for responding to the AESCC's recommendation.

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ii Unlike the federal Species at Risk Act, which requires a decision by the government within 90 days, there is no timeline for when the Alberta government must accept or reject the ESCC's recommendation.



Bears that spend more time near roads and other developed areas are much more likely to die as a result of human activity.

Photo John E. Marriott, wildernessprints.com



Roadside grizzly bears are popular tourist attractions, but these types of interactions only serve to habituate the fearless bears.

Photo John E. Marriott,  
wildernessprints.com



## Public Support for Grizzly Bear Conservation and Recovery

Albertans recognize that their province is blessed with an abundance of wildlife, wilderness, water and other natural assets. They enjoy and celebrate these assets in a number of ways, from sport hunting and fly fishing to horseback riding and backcountry camping.

There appears to be widespread support among Albertans and other Canadians for ensuring grizzly bears remain a part of Alberta's natural and cultural heritage, even if it means reducing the amount of industrial development and human activity in grizzly bear habitat. A survey of Alberta residents from Jasper, Edmonton and communities in the Yellowhead area east of Jasper National Park (Cadomin, Hinton and Robb) found high levels of support for grizzly bear conservation.<sup>91</sup> Respondents overwhelmingly stated that "a healthy grizzly bear population is a sign of a healthy environment" and that "it is important that Alberta always has a sustainable grizzly bear population." Respondents believed quite strongly that it was acceptable to establish more protected areas with no industrial activity or motorized recreational use to better protect grizzly bears, and were generally supportive of closing roads and/or managing access in grizzly bear habitat. A ban on grizzly bear hunting until the population recovered to a self-sustaining level was also strongly supported.

While the Government of Alberta's October 2007 *Land-Use Framework Workbook Summary Report* does not refer specifically to grizzlies, Albertans' responses to questions about the future of industrial development and the health of the ecosystems that support grizzly bears indicate a desire for more and better protection of our natural resources.<sup>92</sup> For instance, 74.3 per cent of participants believed that "the balance between developing and using our land versus conservation of our land is too focused on economic development and growth." More than 70 per cent of participants would be "willing to accept limits to energy development to provide for more habitat protection," and almost 66 per cent would be "willing to accept limits to forestry development to provide for more habitat protection." Fully 94 per cent of participants were "concerned" or "very concerned" about the "loss of biodiversity and wildlife habitat" in Alberta.

Other informal polls confirm that Albertans support grizzly bear conservation. A March 5, 2010 *Calgary Herald* online poll, for instance, found that the vast majority of respondents (81 per cent) believed that grizzly bears should be designated a threatened species in Alberta.<sup>93</sup>

Editorials by the editorial boards of Alberta's major newspapers reflect Albertans' concerns and desires. A March 10, 2010 editorial in *The Calgary Herald*, for instance, asked Mel Knight, Alberta's current Sustainable Resource Development Minister, "to stop playing politics with Alberta's grizzly bears.... Knight, who is under pressure from factions on both sides of the grizzly issue, must have the courage to take the long view.... It is zero hour for Alberta's grizzlies. It is time for this province to end the endless studies and take a stand."<sup>94</sup>

In early April 2010, a *Globe and Mail* editorial expressed disdain for the Alberta government's lack of action on the grizzly bear file. "Alberta seems to be on track for the extirpation of the grizzly bear despite a provincial moratorium on hunting the great beasts.... What is so senseless about the decline is that the Alberta government has known about it for years, and has refused, even in the face of repeated recommendations from a government-appointed panel, upon which sit not only wildlife biologists and conservationists, but also representatives of stakeholder groups, including First Nations, ranchers and even oil-and-gas industry representatives, to place grizzlies on the threatened list.... Without the Alberta government's willingness to stand fully behind a grizzly-bear recovery plan, the species will be extirpated."<sup>95</sup>

The Canadian Association of Petroleum Producers (CAPP) has made public statements about the importance of ensuring a future for the grizzly, and representatives from the forestry industry have likewise supported (in principle) the need to manage road access to ensure the grizzly's persistence. The participation of both these sectors, and many other stakeholders, on the grizzly bear recovery team indicates a broad level of commitment (at least in principle) to maintaining grizzly bears in Alberta.

These statements from influential stakeholders reflect a broad public consensus in Alberta about the need to protect grizzly bears (and other species) from decline, part of a growing public sentiment that it's time to better protect Alberta's environment from overexploitation and unsustainable land-use practices.

With the Alberta and Canadian public supportive of grizzly bear conservation and recovery in Alberta, it would seem the perfect time for the Alberta government to take the necessary steps.

## THE STATUS OF GRIZZLY BEARS IN ALBERTA

Recent scientific research and analysis has confirmed that the Alberta grizzly bear is as “threatened” today as it was when the Alberta Endangered Species Conservation Committee (AESCC) recommended it be listed as such in 2002. The overall population is small and fragmented, and recent analysis of human-caused mortality rates suggest that the population is declining.



Grizzly bears are slowly disappearing from western Alberta because of increasing levels of industrial and residential development.

Photo John E. Marriott, wildernessprints.com

### Small and shrinking

The Alberta government's official population estimate, based on the results of one of the most accurate studies in the world, suggests there are approximately 691 bears on Alberta provincial lands and some portions of Banff, Jasper and Waterton national parks (See Map 3).<sup>96</sup> The total number of bears in Alberta, including an estimated 70 bears in Banff and Jasper national parks that were not included in the province's population estimate, is approximately 760.<sup>97</sup>

Additional analysis indicates that the westward wave of extirpation that has plagued grizzly bears in North America for the last two centuries continues today. Although grizzly bears range over most of western Alberta (see Map 3 and 4), the amount of habitat that grizzly bears *occupy* is much smaller than was previously thought. “Occupied” grizzly bear habitat is defined by the regular occurrence of females with cubs. The area occupied by grizzly bears identified in the 2010 status report is about half the amount identified in the recovery plan<sup>98</sup> and the 2002 status report.<sup>99</sup> This indicates that occupied grizzly bear habitat likely has shrunk considerably over the last 20 to 30 years.

Although the overall trend of the provincial grizzly bear population is unknown, grizzly bear populations are likely declining in many parts of Alberta.<sup>100</sup> A population viability assessment of grizzly bears in the Yellowhead and Grande Cache population units indicates that this population is shrinking.<sup>101</sup> Another study found that forestry activity likely will extirpate grizzly bears outside of protected areas in the Yellowhead by 2040.<sup>102</sup>

Given that human activities are predicted to increase dramatically in Alberta grizzly bear habitat,<sup>103</sup> it is likely that grizzly bear populations in Alberta will continue to decline unless adequate habitat security is maintained and human-caused mortalities are decreased. A population viability assessment conducted by McLoughlin in November 2009 indicates there is a 98.6 per cent risk of population decline by 30 per cent or more over the next 36 years. This suggests a province-wide population decline of just over 4.4 per cent per year.<sup>104</sup>

The roads associated with forestry and oil and gas activity significantly increase the risk of human-caused grizzly bear mortality.

Photo Global Forest Watch Canada



## Habitat fragmentation and connectivity

Although grizzly bears in Alberta can be considered a single genetic unit, a recent analysis of Alberta's grizzly bears indicates that the population is in the process of being fragmented into seven distinct population units (See map 4).<sup>105</sup> (See Appendix 1 for more information on each grizzly bear population unit.)

The seven grizzly bear population units in Alberta are:

1. Alberta North (north of HWY 43): **71 bears**
2. Swan Hills (bounded by HWY 43, HWY 2 and the Athabasca River): **23 bears**
3. Grande Cache (Between HWY 16 and HWY 43): **353 bears**
4. Yellowhead (Between HWY 11 and HWY 16): **82 bears**
5. Clearwater (Between HWY 1 and HWY 11): **75 bears**
6. Livingstone (Between HWY 3 and HWY 1): **90 bears**
7. Waterton (South of HWY 3 to U.S. border): **51 bears**

Map5: Grizzly bear population/management units in Alberta



These population units are found in management areas defined largely by geographic and anthropogenic features that provide some cumulative level of natural and human-caused fragmentation<sup>iii</sup>. Barriers include rugged terrain – such as the Continental Divide, lakes and rivers – and major highways and associated human development. Some of these population units, particularly the Clearwater, Yellowhead, and Swan Hills units, are very small and increasingly isolated.<sup>106</sup>

Although analysis indicates that bears from Montana and BC have shared genes with Alberta bears, especially south of Highway 1, there is no direct evidence of recent grizzly bear immigration into Alberta from these areas or from the Northwest Territories. As a result, there is little reason to expect that the immigration of bears from other jurisdictions will improve the current conservation status of grizzly bears in Alberta.<sup>107</sup>

## Human-caused grizzly bear mortality

Alberta's grizzly bear population is being subjected to unsustainable levels of human-caused mortality. According to the 2010 status report, "a large area of grizzly bear habitat, particularly south of Highway 16, currently appears to be a population sink, but could support a self-sustaining population if human-caused mortality was reduced."<sup>108</sup>

In Alberta, human-caused mortality accounts for more than 90 per cent of all grizzly bear deaths.<sup>109</sup> Between 1990 and 2008, at least 495 grizzly bears died in Alberta. Four hundred and fifty-six of those deaths occurred on provincially managed land, a minimum of 420 (92 per cent) of which were human-caused.<sup>110</sup> In Alberta's national parks (Waterton Lakes, Banff, Jasper) during the same period, 39 grizzly bear mortalities were recorded, at least 26 of which (67 per cent) were human-caused. A minimum of 172 (39 per cent) human-caused mortalities in Alberta were of females.<sup>111</sup>

The Government of Alberta's 2010 grizzly bear status report assumes that 40 per cent of grizzly bear mortalities are never reported. Based on these figures, the estimated minimum total (known and unknown) number of human-caused grizzly bear mortalities in Alberta between 1990 and 2008 was 624, an average of 33 bears each year.

iii The term "population unit" and "management area" are both used to refer to the seven grizzly bear populations in Alberta. Strictly speaking, "population unit" refers to grizzly bears on both federal and provincial lands that occupy a given area. "Management area" refers to the provincial designation of the land they inhabit. For the sake of clarity, we have used these terms more or less synonymously. For instance, the Yellowhead grizzly bear population unit can be found on both provincial and federal land in the Yellowhead grizzly bear management area.



Earlier in this report, we suggested that sustainable human-caused mortality rates are between 2.8 per cent and 4.9 per cent of a total population, depending upon habitat quality and reproductive rates. Most of Alberta's grizzly bear population lives in moderate to poor habitat and suffers from some of the lowest reproductive rates in North America, which suggests that 2.8 per cent is the appropriate human-caused mortality threshold to use.<sup>112</sup> Between 2004 and 2008, the estimated human-caused mortality rate in Alberta was 4.4 per cent, more than 1.5 times the 2.8 per cent threshold.<sup>113</sup>

It is even more important to analyze the impact of human-caused mortality at the population unit rather than the provincial scale.<sup>114</sup> For instance, the Swan Hills population could be shrinking because of high local mortality rates even though province-wide mortality rates are below threshold levels.

Between 2004 and 2008, four of Alberta's population units were subject to unsustainable levels of human-caused mortality (See Table 1). The Swan Hills population unit sustained human-caused mortality rates more than three times the sustainable threshold of 2.8 per cent. Human-caused mortality in the Clearwater population unit was more than twice the sustainable limit, and human-caused mortality in the Livingstone and Waterton-Castle units was also excessive.

Only two population units had sustainable levels of human-caused mortalities. At 2.6 per cent, the human-caused mortality rate in the Yellowhead population unit was just under the sustainable threshold. Only the human-caused mortality rate (1.8 per cent) in the Grande Cache population unit, which includes large protected and/or roadless areas, was significantly lower than the threshold.

**Table 1:** Human-caused mortality rates in Alberta south of Grande Prairie (2004-2008)

Population Unit	Average annual total human-caused mortality	Population Estimate	Annw	Annual Sustainable Mortality Threshold	Annual HCM rate as a percentage of sustainable mortality rate
Waterton-Castle	2.0	51.0	3.9	2.8	140
Livingstone	2.8	90.0	3.1	2.8	110
Clearwater	2.8	45.0	6.2	2.8	220
Yellowhead	1.1	42.0	2.6	2.8	90
Grande Cache	6.2	353.0	1.8	2.8	60
Swan Hills	2.0	23.0	8.7	2.8	310
Total	16.9	604.0	4.4	2.8	160

Information from *Status of the Grizzly Bear in Alberta*: Update 2010, p.25.

Roads reduce habitat security for grizzly bears. About 90 per cent of all grizzly bear mortalities are within 500 m of a road or trail.

Photo John E. Marriott, wildernessprints.com



## Road densities and habitat security

The most crucial element in grizzly bear recovery is providing adequate amounts of secure habitat.<sup>115</sup> Road densities largely determine habitat security, with 0.6 km of road per square kilometre of area being the threshold for secure habitat.

Various studies of grizzly bear habitat in Alberta have found road densities well in excess of these thresholds. One study found that open-route densities in grizzly bear habitat from the U.S. border to Grande Prairie averaged 2.7 km/sq. km., with maximum densities approaching 8.0 km/sq. km.<sup>116</sup> A more recent study found that road densities in the Waterton-Castle population unit were between 0.75 and 1.9 km/sq. km.<sup>117</sup> High open-route densities in most of northwestern Alberta appear to preclude adequate levels of habitat security.<sup>118</sup>

Although a formal habitat-security analysis has not been conducted in Alberta, we know that much of grizzly bear habitat in Alberta cannot be considered secure, particularly south of Highway 16.<sup>119</sup> Publicly available research indicates that only a *maximum* of 41 per cent (54,254 sq. km.) of the recovery area south of Grande Prairie currently has the potential to provide enough habitat security to ensure a future for grizzly bears.<sup>iv</sup> It is unlikely that more than 20,000 sq. km north of Grande Prairie (19 per cent of the Alberta North management unit) can provide adequate habitat security without significant restoration efforts (See Map 4). If the government does maintain this portion of the Alberta North management area as a priority area, then only a maximum of 30 per cent of the entire recovery area will have the potential to provide adequate levels of habitat security for grizzly bears. (See Appendix 2 for more details on the methodology used to draw these conclusions.)

Not surprisingly, the highest human-caused mortality rates and/or the lowest densities of grizzly bears usually occur where road densities, which largely defines habitat security, are highest. The one exception is the Clearwater management area. Priority areas in the Clearwater have *relatively low road densities* (0.48 km/sq. km), but the entire management area has *high rates of human-caused*

*mortality* (6.2 per cent per year) and a small population that occurs at very low densities (5.25 bears/1000 sq. km). This indicates that humans may be much more lethal to bears in this management unit than they are in other places with road-density thresholds around 0.6 km/sq. km. Lower road densities and higher levels of habitat security may be required to maintain grizzly bear populations in these areas. These results are consistent with other studies, which suggest habitat security in most of Alberta is inadequate.<sup>120</sup>

Conversely, in the southwestern corner of the Grande Cache population unit, where road densities are low and much of the landscape is protected as parks, there are more bears than anywhere else in the province.<sup>121</sup> This suggests that habitat security is high, and that habitat alteration and road building by forestry, mining and hydrocarbon development elsewhere are causing declines in grizzly bear numbers.<sup>122</sup> It also suggests that protecting habitat and maintaining low road densities are the most effective means of recovering Alberta's grizzly bear population.<sup>123</sup>

Unfortunately, increasing levels of industrial development proposed for areas outside of protected zones in Alberta will likely lead to lower levels of habitat security, higher rates of human-caused mortality, and further population declines.<sup>124</sup> Several Forest Management Plans allow road densities to exceed sustainable thresholds and/or mortality risk to increase.<sup>125</sup> In particular, forestry development in the Grande Cache population unit will lead to increased road densities and increased levels of human-caused mortalities.<sup>126</sup> A recently approved forest management plan for the E8 forest management unit on the border of Willmore Wilderness Park indicates that road densities will increase beyond sustainable levels over the next 10 years.<sup>127</sup>

iv This is only an estimate. Habitat security must be measured at a much finer scale than we are able to do here, but the fact that average road densities in core areas are below threshold levels (0.6 km/sq.km.) indicates these areas have the potential to provide adequate habitat security. Additional analysis at the Grizzly Bear Watershed Unit scale is required to confirm this finding.



Alberta's grizzly bear population is being fragmented into several small population units, most of which are at significant risk of further decline.

**Photo** John E. Marriott, wildernessprints.com

## Do we have enough bears?

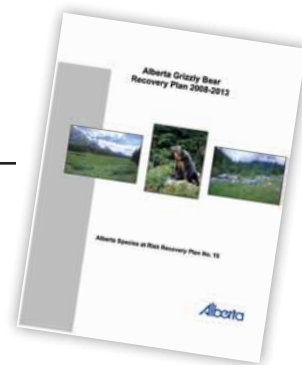
As noted above, Alberta's grizzly bear population is being fragmented into several small population units, none of which is large enough by itself to support a self-sustaining grizzly bear population over the long term. The Grande Cache management area harbours the largest population at 353 individuals, but it is still not big enough to be considered a demographically robust population unit (i.e. capable of surviving for centuries on its own). Although this BMA is likely connected to grizzly bears in BC, there is little reason to believe that immigration will keep this, or any of Alberta's other trans-boundary populations, from declining in the face of excessive human-caused mortality.<sup>128</sup>

All the other population units in Alberta are dangerously small. The Swan Hills management area, which appears to be totally isolated by highways and other human development, is one of the most endangered populations in North America. It harbours only 23 grizzly bears on a landscape that has been heavily impacted by industrial development. The Clearwater and Yellowhead management areas each boast less than 100 grizzly bears, and the rugged terrain of the Continental Divide and fragmentation by east-west highway corridors leave them increasingly isolated.<sup>129</sup> As mentioned earlier, isolated populations of this size have little chance for long-term survival without dramatic intervention.<sup>130</sup>

Although the Livingstone and Waterton-Castle population units are connected to populations in BC and Montana, they too are perilously small (90 and 51 individuals, respectively). Without dramatic changes to land-use management in southern Alberta, immigration will not be able to keep these populations from declining in the face of excessive human-caused mortality.<sup>131</sup> Some biologists believe that bears moving into Alberta from BC and Montana may be caught up in the high levels of conflict and mortality in this province, essentially ensuring a permanent, and fatal, one-way trip.<sup>132</sup>



# ASSESSING THE EFFECTIVENESS OF GRIZZLY BEAR RECOVERY EFFORTS IN ALBERTA



The goal of the Alberta Grizzly Bear Recovery Plan (2008-2013) is to “restore, and ensure the long-term viability of, a self-sustaining grizzly bear population” across “current provincial distribution and occupancy levels.”

One of the primary measures of success is to “maintain, at a minimum, current provincial distribution and occupancy levels i.e.,  $\geq 228,000$  sq. km of contiguous grizzly bear range.” Unfortunately, as is evident from the analysis below, it appears that both the government’s recovery plan and its efforts to implement recovery efforts are inadequate.

## Alberta’s grizzly bear recovery plan is inadequate

Despite a stated commitment to base decisions and recovery efforts on science and the precautionary principle, an analysis of the best available scientific information indicates that the current recovery plan does not appear capable of achieving the plan’s stated goal or measures of success.

### Human-caused mortality

The *Alberta Grizzly Bear Recovery Plan* stipulates that human-caused mortality must be maintained below four per cent annually.<sup>133</sup> The plan states that “four percent is a conservative rate during the population recovery phase, which has been used successfully in the Yellowstone ecosystem, and may be increased once populations have recovered.”<sup>134</sup>

However, research by McLoughlin indicates that human-caused mortality exceeding 2.8 per cent in moderate habitats and 4.9 per cent in productive habitats increases the likelihood of population decline. He maintains that grizzly bear populations of less than 100 individuals likely cannot tolerate even these mortality rates regardless of habitat quality. For grizzly bear populations in areas where habitat quality is poor or where human disturbance has decreased the ability of grizzly bears to access adequate food supplies, human-caused mortality rates must be minimized.<sup>135</sup>

Grizzly bear habitat in the greater Yellowstone ecosystem, where a four per cent mortality threshold was used, is more productive than most of the habitat in the more northerly and less productive Eastern Slopes and mountains of Alberta. Given the quality of the habitat in much of Alberta and the low reproductive rates of bear populations in this province, the recovery plan’s mortality threshold is likely much too high to maintain, never mind recover, grizzly bear populations in Alberta.

Most grizzly bear population units in Alberta are small (fewer than 100), live in relatively unproductive habitats, and/or have

low reproductive rates. Therefore, a human-caused mortality threshold of 2.8 per cent is likely more appropriate than the four-per-cent rate used in Alberta’s grizzly bear recovery plan.<sup>136</sup>

The recovery plan also suggests that there may be “variance among management areas,” but that “they should [all] be near provincial targets.”<sup>137</sup> However, the 2010 status report makes it clear that analyzing the impact of human-caused mortality at the provincial scale is not adequate.<sup>138</sup> Human-caused mortality rates should be calculated annually at the population-unit scale to ensure that each population unit does not exceed the 2.8 per cent mortality rate threshold.

### Habitat security

Although the most crucial element in grizzly bear recovery is providing adequate amounts of secure bear habitat,<sup>139</sup> the Alberta recovery plan does not provide adequate levels of habitat security to reach its stated goal of “restor[ing], and ensur[ing] the long-term viability of a self-sustaining grizzly bear population” at “current provincial distribution and occupancy levels.”<sup>140</sup>

As stated above, current levels of habitat security are inadequate. Only 41 per cent of the recovery area south of Grande Prairie has the potential to provide adequate secure habitat for grizzly bears under current conditions, and it is unlikely that more than 20,000 sq. km north of Grande Prairie (19 per cent of the Alberta North management unit) can provide adequate habitat security (See Map 4).

However, implementation of the current recovery plan would actually allow the amount of secure habitat to decrease. The recovery plan allows industrial activity and the dense networks of roads that accompany it to occur in all but 2,400 sq. km of each grizzly bear management area. These “priority areas” only amount to seven per cent of the recovery area that isn’t already protected as a park. When added to the protected areas that have the potential to provide adequate habitat security (20,890 sq. km), the maximum amount of secure habitat provided by the recovery plan is only approximately 15 per cent of the recovery area. Habitat security in the rest of the recovery area, where open-route densities would likely become too high, would be inadequate to maintain grizzly bear populations.

Although the Alberta government has designated considerably more core areas (33,364 sq. km) than are stipulated in the recovery plan, there is no legal obligation or policy document ensuring they are maintained.

Another major deficiency of the recovery plan is its definition of “open routes.” In Alberta, an “open route” is defined as “a route without restrictions on motorized vehicle use.” “Restricted routes” allow motorized access that is controlled [presumably by gates] in “time, space or activity for the purposes of grizzly bear conservation.”<sup>141</sup> Only those routes without restrictions are considered in the calculation of open-route density. However, this rather narrow definition of “open route” omits from road-density calculations numerous roads and trails that are supposed to be closed by “restrictions,” but which likely see significant amounts of motorized use anyway.

In other jurisdictions that have successfully recovered grizzly bears, such as those in the U.S., all potential sources of access are included in open-route density calculations because of the of managing motorized use on existing roads.<sup>142</sup> As noted earlier, gating and other attempts to prevent public use of industrial access roads are rarely effective.<sup>143</sup> Funding and personnel necessary to maintain road closures and enforce regulations are rarely adequate, resulting in limited closure effectiveness. Public disregard of road closures, as well as continual administrative use, often reach levels that make closures ineffective. Even the Alberta Fish and Wildlife Division (AFWD) acknowledges that “adequate enforcement is not possible over a network of interconnecting roads with many entrance and exit points.”<sup>144</sup> “Restricted roads,” therefore, still receive substantial levels of human use and cannot legitimately be considered “closed” for their effects on bears when calculating the open-route densities.<sup>145</sup>

The same appears to hold true in Alberta, where Sustainable Resource Development’s own Fish and Wildlife Division recognizes that managing access on roads is not realistic. The “Wildlife Guidelines for Land Use Activities in Areas 3 and 4 of the Southwest Region” in Blue Ridge Lumber’s “Detailed Forest Management Plan” states that the area in question (which includes portions of the Grande Cache Grizzly Bear Management Area and the highly threatened population in the Swan Hills Management Area) “is becoming an intensely industrialized landscape with increasing timber harvesting and oil and gas development... One of our major fisheries and wildlife management concerns is the increasing amount of all weather/high grade roads that have been constructed and are planned for the future. The continued high value of this area for the fish and wildlife is threatened as an extensive network of high grade roads makes the area easily accessible all year round.... Adequate enforcement is not possible over a network of interconnecting roads with many entrance and exit points.... Unmanned gates do not remain closed on roads that are used by several companies.”<sup>146</sup>

If grizzly bears are to be effectively recovered in Alberta, all routes that are considered to be either “open” or “restricted” must be included in any calculation of open-route density in Alberta’s grizzly bear management areas. This will provide a more accurate assessment of habitat security and mortality risk than the current method. v

## **No strategy to maintain landscape-scale connectivity**

Alberta’s grizzly bear population is being fragmented into seven small population units. The major cause of this fragmentation is high traffic volumes on major east-west highways and associated development. The most disconnected population unit is in the Swan Hills management area, which already may be totally isolated.

Michael Proctor, a PhD biologist and grizzly bear expert, said that because several fragmented sub-units are small, maintaining regional connectivity may be necessary to ensure their persistence.<sup>147</sup> This will require a proactive long-term strategy to limit development and/or maintain permeability (perhaps by using a combination of fencing and crossing structures) across east-west highway corridors in Alberta, as has been done in Banff National Park. Unfortunately, the recovery plan provides no analysis or information on how and when this should be done.

## **Alberta government has reduced the size of the grizzly bear recovery area**

As discussed earlier, the stated intention of Alberta’s grizzly bear recovery plan is to “maintain, at minimum, current provincial distribution and occupancy levels i.e., >=228,000 sq. km of contiguous grizzly bear range.” Although it is never explicitly called a “recovery area,” the spatial expanse of the area in which grizzly bears are to be allowed to live includes approximately 228,000 sq. km of Alberta provincial lands and another 18,000 sq. km of federally managed national parks. (See Map 1.) This is the area that was identified by and agreed to by the multi-stakeholder grizzly bear recovery team, and which was formally adopted by the provincial government in 2008.

However, the recent *Status of Grizzly Bears in Alberta: Update 2010* indicates that the provincial government, without public consultation, has significantly reduced the size of the provincial grizzly bear population units that make up the recovery area. The total area of the population units identified on page 6 (See Map 3) of the grizzly bear status report appears to be identical to the map of the core and secondary areas on page 2, and considerably smaller than the recovery area described in the recovery plan (See Map 2), and even the map of grizzly bear habitat and current distribution of grizzly bears on page 11 of the status report (See Map 4).

This leaves a great deal of confusion about where, exactly, grizzly bear populations will be allowed to recover in Alberta. As we will show later, a recovery area smaller than the one already indentified in the recovery plan will be unlikely to be able to achieve the goal of the recovery plan to “ensure the long-term viability of a self-sustaining grizzly bear population” in the province of Alberta.

v One effective method used in the United States is to allow open road densities up to 0.6 km/sq. km and total road densities (which includes both open and restricted roads) up to 1.2 km/sq. km. This allows both open and closed roads to be managed at adequately low levels.

## Alberta government failing to implement recovery plan habitat requirements

The grizzly bear recovery plan stipulates that a minimum of one priority area of 2,400 sq. km should be designated in each of seven grizzly bear management areas. This amounts to a total of 16,800 sq. km to be managed as “grizzly bear priority areas” with road densities at or below 0.6 km/sq. km. The recovery plan stipulates that road densities in the rest of the recovery area outside of national parks (205,000 sq. km, or 85 per cent of the recovery area) should be managed at or below 1.2 km/sq. km.

According to the Alberta government’s 2010 grizzly bear status report, the government isn’t following the grizzly bear recovery plan.<sup>149</sup> Grizzly bear priority areas cover approximately 33,364 sq. km of the recovery area. Although these priority areas exceed the minimum requirements in the recovery plan by almost 19,000 sq. km, most of the rest of the recovery area is not being managed according to the requirements in the recovery plan.

Instead of managing road densities in all of the rest of the recovery area at or below 1.2 km/sq. km, as stipulated in the recovery plan, Alberta Sustainable Resource Development has designated approximately 23,224 sq. km of secondary areas in the recovery area south of Grande Prairie. No secondary areas have been designated in the Alberta North grizzly bear management area. This means the government has committed to manage just 11 per cent of the provincial lands stipulated in the recovery plan at road densities at or below 1.2 km/sq. km.

To fulfill the requirements in the recovery plan, the government needs to designate and manage an additional 40,162 sq. km south

of Grande Prairie as secondary areas (i.e. road densities at or below 1.2 km/sq. km). North of Grande Prairie, 2,400 sq. km would need to be designated as a priority area, as well as an additional 105,000 sq. km managed as “secondary areas.”

However, the Alberta status report indicates that only approximately 20,000 to 25,000 sq. km in the Clear Hills-Chinchaga area of the Alberta North management unit offer enough habitat security (i.e. low road densities) for grizzly bear persistence (See Map 4), leaving the on-the-ground reality well short of the requirements in the recovery plan (See Map 2). If the Alberta government wants to adhere to its grizzly bear recovery plan, much of this area likely will need to be restored through road reclamation efforts to meet the 1.2 km/sq. km road-density thresholds stipulated in the recovery plan.

(See Appendix 3 for the methodology used to make these calculations.)

## Alberta government failing to implement road-density thresholds

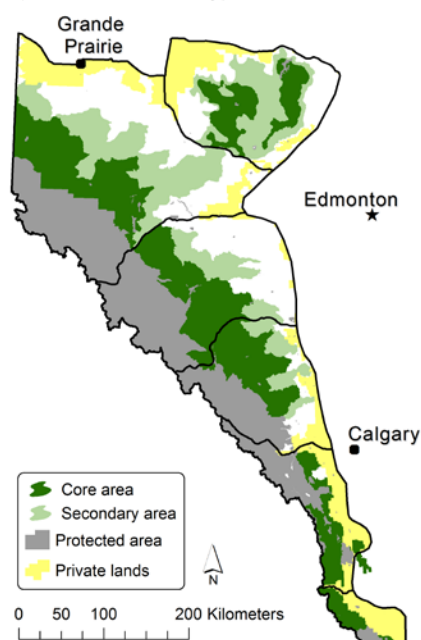
In order to achieve the goal of grizzly bear population recovery, the Alberta government will need to change the way business is done on Alberta’s public land. The government must ensure that forestry, mining, oil and gas companies cooperate to keep industrial access roads below threshold densities that allow for grizzly bear persistence. Although the government has designated “priority” and “secondary” areas on maps, it appears to be “business as usual” when it comes to approving industrial-access plans.

Alberta Sustainable Resource Development has developed and/or approved several Forest Management Plans (FMPs) that fail to meet the minimum road-density requirements set out in the Alberta Grizzly Bear Recovery Plan it adopted in 2008. For example, road densities in the *Forest Management Unit E8 Forest Management Plan* exceed thresholds in an area of important grizzly bear habitat just outside the Willmore Wilderness Park in the Grande Cache Grizzly Bear Management Area.<sup>150</sup> The plan recognizes the existence of the grizzly bear recovery plan and the primary and secondary grizzly bear areas that have been designated to manage road densities and mortality risk. In fact, the majority of the FMU falls within lands designated as core area. Current open-road densities in core areas average 0.5 km/sq. km, which is below the road-density threshold for core areas stipulated in the recovery plan. Current average road density in secondary areas (1.3 km/sq. km) already exceeds the road-density threshold for grizzly bear habitat outside of core areas.

The new road network proposed for timber harvesting in the E8 FMU will likely increase mortality risk for grizzly bears beyond sustainable thresholds. Average road densities in core areas will increase to 0.7 km/sq. km, above the threshold stipulated in the recovery plan. Overall there will be a 43.3 per cent increase in open-road density in core areas. Average road densities in secondary areas will increase to 1.45 km/sq. km.

**Map 6** Grizzly bear conservation (core and secondary) areas

Source Identification of Priority Areas for Grizzly Bear Conservation and Recovery in Alberta, Canada, Nielsen et. al, 2009)





The same holds true for Blue Ridge Lumber's Detailed Forest Management Plan for parts of the Grande Cache and highly threatened Swan Hills management areas, which was amended in 2009. The amended plan states that the Grizzly Bear Recovery plan "recognizes that reduced grizzly bear survival and reproductive success are linked to human activities in core and secondary areas." However, all four harvesting scenarios presented in the plan greatly decrease the probability of grizzly bear occurrence and greatly increase the probability of grizzly bear mortality over most of the FMA.<sup>151</sup>

Sundance Forest Industries' Forest Management Plan (2008) also indicates that grizzly bears in the highly threatened Yellowhead population unit will be negatively impacted by the "desire of the Provincial Minister "to provide for the fullest possible economic

utilization of timber from the forest management area ... by maximizing the value of the timber resource base."<sup>152</sup> The grizzly bear habitat analysis revealed that road densities in the portions of Sundance's Forest Management Area within the grizzly bear core area would exceed thresholds set out in the recovery plan, and that mortality risk will increase, "associated with public use of temporary access structures [i.e. roads], over the duration of the harvest sequence (2008-2016) and for a couple of years afterward."<sup>153</sup> There is no detailed plan for managing access, nor is there a timeline for how and when roads will be deactivated.

All three of these examples indicate that the Alberta government is not ensuring that industrial activity in grizzly bear habitat is conducted within the limits set out in its own recovery plan.

## Debunking the Hunting Myth

Some Albertans support hunting as an "accepted tool" for managing grizzly bear populations. However, there is no scientific evidence to support the claims that sport hunting these large omnivores is a necessary part of keeping people safe and recovering Alberta's grizzly bear population.

### Myth #1: Hunting bears will help to keep them wild and wary of humans

There is absolutely no scientific evidence supporting the idea that hunting grizzly bears is necessary to keep people safe.. This claim appears to be premised on the behaviour of hunted ungulate populations, which are less tolerant of the presence of humans than populations in parks where hunting is prohibited. However, there is a major difference between bears and ungulates – bears are not herd animals. Bears are predominantly solitary animals or small family groups such as females with cubs. Females with cubs cannot be hunted. Bears that are hunted are singular individuals, and there is no opportunity for other individuals to learn to fear humans when one of their kind is killed by a hunter.

There are far more effective management approaches to allow people and grizzly bears to co-exist without killing so-called "problem" bears. Where people and grizzly bears interact in recreational settings, locating some campgrounds and trails out of prime grizzly habitats, removing native food plants for grizzly bears from campground areas, controlling food and garbage, and using non-lethal aversive conditioning on grizzlies that come into developed areas has proven effective

to minimize bear-people conflicts in a non-lethal manner. Electric fencing and shepherd dogs are effective ways of keeping bears away from livestock and other attractants.

Educating people about how to avoid conflicts with bears, how to hunt safely in bear country and how to carry and use bear spray are the most effective means of preventing dangerous bear-human encounters. Pepper spray, for instance, stops undesirable behaviour by bears 92 per cent of the time, and has been proven to be more effective than firearms.<sup>154</sup>

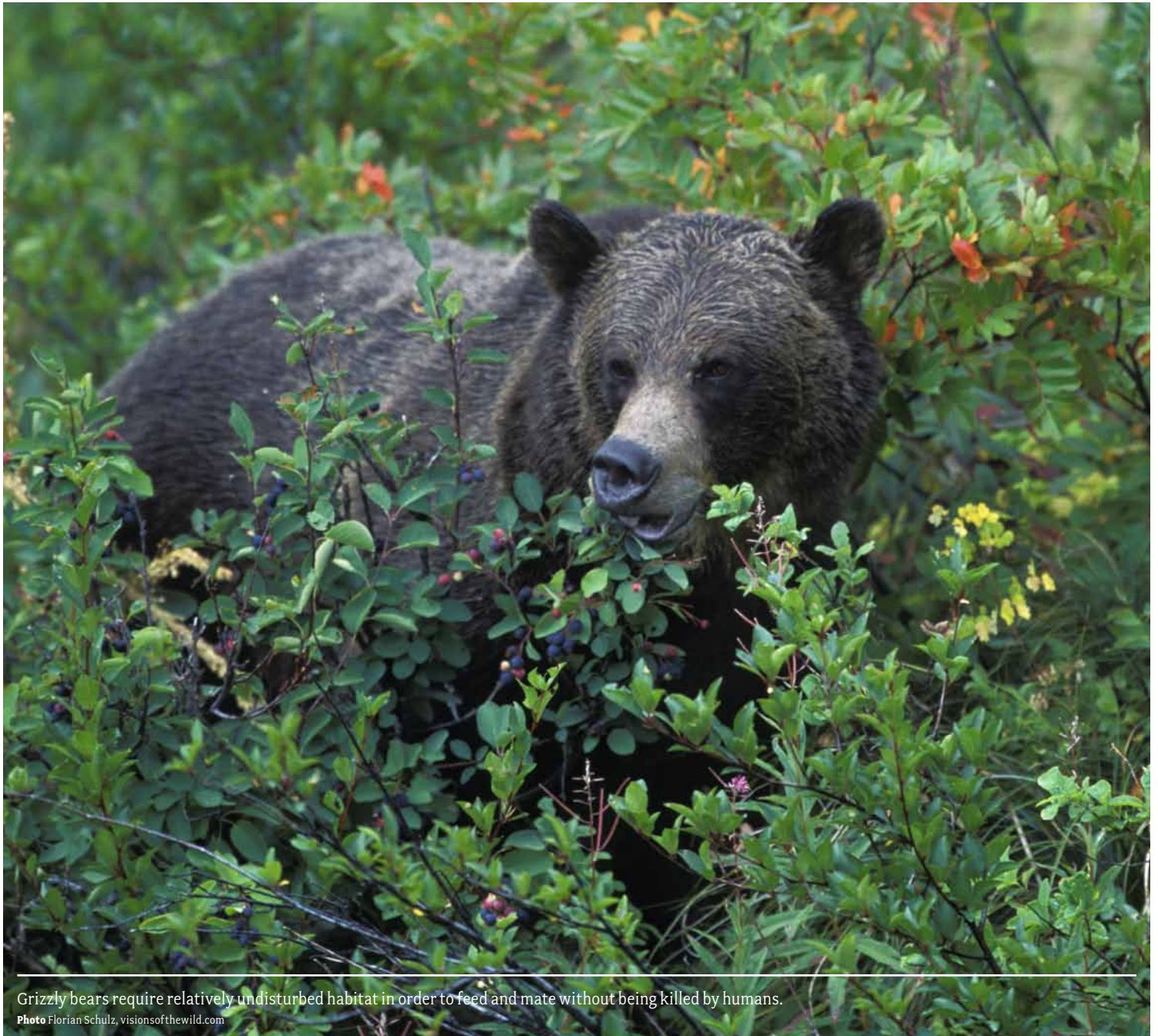
### Myth #2: Hunting grizzly bears will keep the population healthy by eliminating older bears.

There is no scientific evidence to support the idea that sport hunting grizzly bears will improve the health of the population. In fact, a 1994 study of grizzly bears in Alberta's Kananaskis Country while the hunt was still occurring concluded that it contributed to population decline because the "hunting mortality of older adult males coincided with an influx of younger immigrant males, which apparently contributed to low reproductive rates."<sup>155</sup>

The trophy hunting of small, threatened populations of grizzly bears increases human-caused mortality. Most of Alberta's population units contain less than 100 individuals and are very susceptible to decline and extinction. Additional deaths (especially of females) caused by hunting poses an additional risk that these populations simply cannot endure.

## The Road to Recovery: An Alternative Future for Alberta's Grizzly Bear

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Grizzly bears require relatively undisturbed habitat in order to feed and mate without being killed by humans.

Photo Florian Schulz, visionsofthewild.com

Although at least one biologist on the recovery team believes that “rapidly deteriorating landscape conditions influenced by industrial development ... is spelling doom for Alberta’s grizzly bears, and the province has already decided to let them go,”<sup>156</sup> the recovery plan indicates that “the recovery team believes the recovery of grizzly bear populations in Alberta is achievable and desirable,” and that “currently occupied habitats (in terms of quality and quantity) are sufficient to support a viable population of grizzly bears in Alberta.”

The goal of the Alberta Grizzly Bear Recovery Plan (2008-2013) is to “restore, and ensure the long-term viability of, a self-sustaining grizzly bear population” in western Alberta. However, the recovery plan does not attempt to define what a “self-sustaining grizzly bear population” in Alberta might look like or how many grizzly bears could be supported across the current recovery area.





With adequate, science-based recovery efforts, the Alberta recovery area may be able to support as many as 2000 grizzly bears.

Photo John E. Marriott, wildernessprints.com

## Can we grow enough grizzly bears?

Although no systematic analysis has been done, it's possible to derive a science-informed approximation of the number of grizzly bears that Alberta's recovery area might support if sufficient recovery efforts were implemented. Using the best available scientific information and expert opinion, we've estimated an appropriate population target for grizzly bear recovery in Alberta (See Table 3).

To identify this target, we estimated potential grizzly bear density for each grizzly bear management area. This estimate was based on expert opinion and the scientific literature on grizzly bear density estimates.<sup>151</sup> Potential densities for each grizzly bear management area were then multiplied by the area of the management area that is located in the green zone to provide a total population estimate.

We also estimated the number of bears that could be supported based on current recovery efforts. For this estimate, we used the same potential density for each GBPU and multiplied it by the area of protected areas and core areas (<0.6 km/ sq. km) in each GBPU that provide the potential to provide adequate habitat security.

The only grizzly bear management area where this methodology cannot be used is Alberta North. There is little scientific data about how many grizzly bears this area might support. Excessive road densities (>4.0 km/sq. km), high levels of human use (particularly forestry and agriculture), and poor habitat productivity make

**Table 3:** Grizzly bear population estimates and recovery targets by Alberta population unit

Alberta grizzly bear management area (size in sq. km)	Population estimate <sup>*</sup>	Current grizzly bear densities (per 1000 sq. km) <sup>**</sup>	Amount of management area in the green zone or protected areas (sq. km) <sup>***</sup>	Potential recovery densities (per 1000 sq. km)	Potential recovery target <sup>****</sup>		Amount of management area currently protected or designated as grizzly bear priority area (sq. km)	Max. recovery target under current recovery efforts <sup>*****</sup>
					Low	High		
North (108,007)	71	Unknown	~20,000 <sup>*****</sup>	4-5	80	100	805 <sup>*****</sup>	4
Swan Hills (22,467)	23	1	17,973	12-15	216	270	5,355	80
Grande Cache (48,617)	353	18.1	42,782	17-20	727	855	19,968	399
Yellowhead (28,529)	82	4.8	17,275	12-15	335	419	16,451	247
Clearwater (17,628)	75	5.2	15,689	12-15	188	235	11,378	171
Livingstone (10,841)	90	11.8	7,589	20-25	151	189	7,613	190
Waterton-Castle (3,993)	51	18.1	1,717	25-30	42	52 <sup>*****</sup>	1,826	55
Eastern Fringe <sup>*****</sup>	15	N/A	N/A	N/A	15	15	N/A	15
<b>TOTAL</b>	<b>760</b>				<b>1754</b>	<b>2135</b>		<b>1161</b>

\*These estimates were derived by adding the estimated number of grizzly bears from the Alberta government's population estimate to the estimated number of bears located in national parks that were not included in the DNA-sampling efforts.

\*\* These densities are from the results of the Alberta government's population estimate. See Status of Grizzly Bears in Alberta: 2010 Update.

\*\*\* "Recovery densities" refer to grizzly bear densities that could be supported using adequate recovery efforts. They are based on a review of the scientific literature, particularly Mowat et al. (2005), and solicited expert opinion.

\*\*\*\* These estimates were calculated by multiplying potential recovery densities by the amount of each population unit that is located in the provincial green zone (i.e. Crown land) and/or protected as a national park. In the Alberta North population unit, we used an estimate of the amount of potentially suitable habitat in the Chinchaga/Clear Hills area (~20,000 sq. km).

\*\*\*\*\* This figure was reached by multiplying potential recovery densities by the amount of area that is either protected or designated as grizzly bear core/priority areas (Nielsen et al. 2009). This is optimistic given the evidence that some protected areas do not provide adequate habitat security and that the government is failing to enforce the road-density thresholds for priority areas as stipulated in the recovery plan.

\*\*\*\*\* This area was not based on percentage of management area in the green zone. Instead, we used an estimate of the amount of potentially suitable habitat that has been identified in the Chinchaga/Clear Hills area (~20,000 sq. km).

\*\*\*\*\* No core-area analysis has been conducted for Alberta North, and no core areas have been designated. Only one protected area, the Chinchaga Wildland Provincial Park, provides some protection to grizzly bears.

\*\*\*\*\* Given private land-conservation efforts in this area, the white zone in this management area may well be able to maintain substantially more bears than the white zone in other grizzly bear management areas. However, it will require concerted efforts to reduce human-bear conflicts.

\*\*\*\*\* The Alberta grizzly bear status report (2010) estimates that 15 grizzly bears eke out an existence east of the sampling grids that were used to estimate the population. These bears face a very high risk of mortality and are unlikely to live long enough to add to population persistence. For the sake of this analysis, we assume that there will always be 15 bears roaming the eastern fringe of grizzly bear range, though this estimate should be used with caution.



Reducing human-caused grizzly bear mortality is the key to recovering Alberta's threatened grizzly bear population.

Photo John E. Marriott,  
wildernessprints.com



much of this management unit unsuitable grizzly bear habitat. An island of approximately 20,000 sq. km of suitable habitat centered on Chinchaga Wildland Provincial Park (805 sq. km) may be able to support approximately 80-100 grizzly bears at very low densities.

This analysis suggests that with appropriate recovery efforts, the Alberta recovery area could potentially support a viable population of approximately 1754 to 2135 grizzly bears. By the same calculation, we estimate that current recovery efforts will allow for a population of only 1161 bears, well below IUCN thresholds for a non-threatened population. (See Table 3)

This is a rough estimate based on average habitat-based densities. It should be tested with further analysis, but it does provide some good news for a change. It seems that the recovery area delineated in the recovery plan (including national parks) could support enough bears to satisfy the provincial government's own criteria for a recovered species, providing that adequate amounts of secure habitat are restored.

The target for a self-sustaining population in Alberta might be set at ~2000 bears well-distributed across the current recovery zone. It would be composed of seven well-connected population units as defined in the current recovery plan.

This would satisfy Alberta's Endangered Species Conservation Committee (ESCC) and the federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which both use criteria set forth by the International Union for the Conservation of Nature (IUCN) to assess the status of wildlife populations (and/or population units).<sup>vi</sup>

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vi IUCN criteria state that if the number of mature breeding individuals in a population unit is less than 1000, it should be considered "threatened." If the number is less than 250, the population should be considered "endangered."

## Some grizzly populations more secure than others

Some of Alberta's grizzly bear population units would be more secure than others. Those population units that provide enough secure habitat to support sufficiently large numbers of bears (Grand Cache) and/or are effectively connected to bear populations in B.C. and Montana (Livingstone, Waterton) would be the most secure. The Yellowhead, Clearwater and Swan Hills population units, however, may never reach recovered status. They will probably always be too small and/or too isolated to support demographically robust populations big enough to ensure long-term persistence. This underscores the need for effective connectivity between all grizzly bear population units.

The Swan Hills population unit, for instance, is one of the most at-risk populations in Canada. It is extremely small (~20 individuals) and extremely isolated. Habitat must be immediately protected and connectivity to the Grande Cache population unit must be restored across Highway 40. It will likely require population augmentation as well, which is being used in other jurisdictions. Once adequate levels of habitat security have been restored, adult females could be brought in from other jurisdictions.

Given the natural-barrier effects associated with the rugged Continental Divide in the Yellowhead and Clearwater population units, demographic connectivity (i.e. female movement) must be restored and/or maintained across Highways 16, 11 and 1 to ensure a future for these population units (Proctor, pers. comm.). Significant amounts of habitat would also need to be protected or managed for grizzly bear security.

## Grizzly bears, water and sustainable development

While this document concentrates on measures required to recover grizzly bears in Alberta, grizzlies do not exist in isolation. Measures to recover Alberta's grizzlies are also entirely compatible with other important provincial initiatives, most notably the *Land-Use Framework* and the *Water for Life* strategy.

The December 2008 *Land-use Framework* (LUF) recognizes that "There are more and more people doing more and more activities on the same piece of land."<sup>158</sup> It also recognizes that "Our land, air and water are not unlimited. They can be exhausted or degraded by overuse...We have reached a tipping point, where sticking to the old rules will not produce the quality of life we have come to expect. If we want our children to enjoy the same quality of life that current generations have, we need a new land-use system." Grizzly bears are a perfect example of what happens when our land, air and water are "degraded by overuse."

The LUF recognizes the importance of managing the cumulative effects of different activities on the same landscape. "Cumulative effects management recognizes that our watersheds, airsheds and landscapes have a finite carrying capacity. Our future well-being will depend on how well we manage our activities so that they do not exceed the carrying capacity of our environment."<sup>159</sup> Grizzlies, as much as any animal, have suffered from past failures to deal with multiple activities – such as oil and gas development,

forestry operations, motorized access – on the same landscape, which is habitat for grizzly bears and a primary source of clean drinking water.

The LUF also places a firm emphasis on the Eastern Slopes. "All of southern Alberta depends on the ecological integrity of the Eastern Slopes for its water supply. It is not uncommon to find oil and gas operations, grazing leaseholders, and forestry operations all active on the same lands. Often these are the same lands on which southern Albertans depend for their recreation. If done in careless or negligent ways, all of these uses have the potential for negative consequences on watersheds, fisheries, habitat and wildlife."<sup>160</sup>

Measures to recover Alberta's grizzlies would also be compatible with the province's *Water for Life* strategy. Measures that reduce road densities and motorized access into grizzly bear habitat in the Eastern Slopes will also help to protect an important source of drinking water for communities across Alberta, Saskatchewan and Manitoba.<sup>161</sup> The 2009 *Water for Life Action Plan* confirms that "Quality of life in Alberta is dependent, in part, upon the health and sustainability of our water resources. As our population continues to grow, so do the demands on the province's water supply. The impacts on our water quality from cumulative human impacts also increase."<sup>162</sup> Once again, measures to improve habitat security for grizzly bears, by better managing this cumulative human impact would also serve the need of protecting our water resources.

## Minimum requirements for grizzly bear recovery in Alberta

Recovering grizzly bears will not be easy. Based on what we know of grizzly bear biology and successful recovery efforts elsewhere, several key objectives will need to be achieved to recover Alberta's grizzly bear population.

### 1. List the grizzly bear as a threatened species and suspend the hunt until the provincial population has fully recovered

Alberta's grizzly bear population deserves to be listed as a threatened species at both the provincial and federal levels. The sensitive nature of this species and the relentless threats that continue to put it at risk make it a primary candidate for threatened listing under both Alberta's *Wildlife Act* and the federal *Species at Risk Act*. Because Alberta doesn't have adequate species-at-risk legislation, and because the Alberta government has proven itself to be reluctant to implement the strategies necessary to protect Canada's grizzly bear population from further decline, it is important that the federal government step in to oversee its protection.

### 2. Develop a legally enforceable recovery plan

The current recovery plan is inadequate to achieve its own goals. A more detailed recovery plan based on the best available science will be necessary to recover grizzly bears in Alberta. There must also be a legal mechanism by which the people of Alberta can hold the government accountable for implementing the recovery plan (in the short term) and recovering grizzly bears (in the long term).

### 3. Reduce human-caused mortality to below threshold levels

The best available science indicates that the mortality threshold in the recovery plan should be reduced from four per cent of the population to 2.8 per cent. Female mortalities should be kept to less than 30 per cent of total mortalities, or 0.84 per cent of the population.

Reducing road densities and providing adequate habitat security will help to keep the number of human-caused mortalities low, but other efforts also will be required. These strategies include food storage orders for people undertaking backcountry activities (hiking, guiding, hunting) in grizzly bear habitat, bear-human conflict specialists to work with

Despite their intimidating look, grizzly bears are actually quite sensitive to human activities.

Photo John E. Marriott,  
wildernessprints.com



landowners experiencing regular conflicts with bears, and more wildlife officers to educate people about how to coexist with bears and how to behave appropriately in bear country (prevention) and enforce regulations (coercion).

A well-funded and effective BearSmart program that includes provincial funding for bear-proof waste-management systems for communities in grizzly bear habitat is also a priority. Educational programs for the general public and targeted audiences (i.e. hunter training and testing programs), and improved livestock-loss prevention and compensation programs are all necessary components of an effective grizzly bear recovery plan. All of these strategies will require a substantial increase in human and financial resources if they are to be effectively implemented.

#### **4. Maintain and/or restore an adequate amount of secure habitat, capable of supporting a grizzly bear population large enough to persist over the long term**

The best available science indicates that each grizzly bear management area needs to be managed for a minimum of 68 per cent of “secure habitat” to recover and maintain “self-sustaining” populations of grizzly bears. This will require maintaining (or restoring) motorized open-route densities at or below 0.6 km/sq. km over most of the recovery area.

The Government of Alberta should immediately conduct a habitat-security analysis for the grizzly bear recovery area. This would be a relatively easy and inexpensive way to manage and monitor grizzly bear habitat over time. A no-net-loss policy of habitat security should immediately be implemented in the grizzly bear recovery area. This would prevent the situation from getting worse while the government and its partners begin ramping up recovery efforts.

Existing core areas, which provide the best opportunities to maintain habitat security, are not well distributed enough to provide adequate amounts of secure habitat for grizzly bear recovery. The vast majority of these core areas are adjacent to national and provincial parks on the western edge of the recovery zone, leaving the eastern portions of the Clearwater, Yellowhead and Grande Cache population units unable to support grizzly bears. In order to achieve the recovery plan’s stated goal, habitat security and/or road density standards will have to be applied across the entire recovery area, not just core areas.

Other methods have been used to identify priority grizzly bear habitat. For instance, the Conservation Biology Institute (CBI), in “Mapping High Conservation Value and Endangered Forests in the Alberta Foothills Using Spatially Explicit Decision Support Tools,” identified areas in the Alberta Foothills Natural Area that contain high habitat security and high conservation value for grizzly bears. Not surprisingly, the area bordering Banff and southern Jasper national parks came out as important, as did a large area straddling the Little Smoky River east of Grande Prairie. Other studies suggest the proposed Castle Wilderness area is important.

Several of these areas have been proposed as protected areas by conservation groups over the years. The Castle wilderness, the area east of Waterton National Park, the Livingstone-Porcupine area between Highway 3 and Kananaskis Country, the Bighorn and Cardinal Divide areas east of Banff and Jasper national parks, and the Little Smoky area have all been the focus of concerted conservation efforts over the last two decades. The protection of these areas, all of which have been identified in one study or another as being important for grizzly bears and the maintenance of biodiversity, would help recover grizzly bears in Alberta.

#### **5. Update all relevant policy documents and industrial plans**

Part of the problem is that current policy documents, and mining, forest management plans and oil and gas plans have not recognized that managing road densities and grizzly bear habitat security is a priority for grizzly bear recovery. Forest management plans that were approved or amended as late as 2009 still don’t incorporate the road-density thresholds laid out in the recovery plan. All plans and policies that will affect grizzly bear habitat over the coming years must be amended to reflect this new reality. The good news is that we know it can be done, and in fairly short order. Sustainable Resource Development has amended several Forest Management Plans over the last few years to help contain the pine beetle outbreak. Surely this kind of responsible and progressive adaptive management can also be invoked to protect threatened grizzly populations from almost certain decline.





Connectivity between grizzly bear population units must be maintained and/or restored to ensure their long-term survival.

Photo John E. Marriott, wildernessprints.com

## 6. **Maintain and/or restore connectivity**

None of Alberta's population units currently support demographically robust grizzly bear populations. Even if current core areas are maintained, it is unlikely that recovery efforts will allow viable grizzly bear populations to reach "self-sustaining" levels. Only two of the population units in Alberta (Grande Cache, and perhaps Yellowhead) have the potential, by themselves, to satisfy the requirements of a demographically robust population. Connectivity between population units must be maintained and/or restored by building crossing structures across highways and limiting industrial and residential development in important movement corridors. The success of these connectivity measures needs to be monitored to ensure successful dispersal of females, sub-population interbreeding, and the assurance of decreased mortality through movement corridors.

## 7. **Increase public support**

Informed public involvement and support for grizzly bear conservation at the local and regional levels is a fundamental part of recovery. The good news is that the Alberta public supports the responsible management of grizzly bears in Alberta. However, if grizzly bear recovery is to be successful, this broad but largely latent public support for grizzly bear conservation and recovery must become more vigorous and engaged. This is a complex issue, and while the public says it supports grizzly bear conservation and recovery, it is clear there is little understanding of what it will take to be successful. The government and its partners must openly and proactively communicate to key stakeholders what is at stake, what the challenges are, and how successful grizzly bear recovery can be achieved.

There should also be a mechanism that allows members of the public to hold the government accountable for implementing the recovery plan (in the short term) and recovering grizzly bears (in the long run).

## 8. **Establish meaningful collaboration between federal and provincial management agencies**

Grizzly bear recovery in Alberta will require effective, on-the-ground collaboration between federal and provincial management agencies so they can work together to manage their respective jurisdictions in ways that allow for the long-term maintenance of viable grizzly bear populations. The grizzly bear recovery plan should not distinguish between grizzly bears on federal and provincial lands. All grizzly bear population units and management areas should transcend the ecologically artificial boundaries that separate national parks from provincial lands. Grizzly bear recovery should be managed by a multi-jurisdictional team of government biologists and resource managers and/or an independent panel of biologists.

The only way to reduce mortality is to maintain and/or restore adequate levels of habitat security for grizzly bears.

Photo John E. Marriott,  
wildernessprints.com



Grizzly bear populations (and population units) exist across multiple political jurisdictions almost everywhere they occur. In Alberta, grizzly bear population units are bisected by numerous jurisdictional boundaries, which means no single political jurisdiction or government agency is responsible for the conservation of an entire population unit. In every case, federal (Parks Canada), provincial (Sustainable Resource Development; Tourism, Parks and Recreation), and municipal (towns, municipal districts) officials share the responsibilities and obligations for managing their piece of the jurisdictional puzzle for the needs of grizzly bears.

Because grizzly bears travel across jurisdictional boundaries and entire populations are never managed by a single agency or jurisdiction, every jurisdiction that has important habitat must have management policies compatible with grizzly bears if populations are to persist. This establishes the need for interagency cooperation and coordination, sharing the goal of long-term maintenance of viable grizzly bear populations.<sup>168</sup>

Grizzly bear populations will need to be counted and monitored at the scale of population units, and datasets (habitat, mortality) should be collected and maintained (and shared) in a consistent and open manner. Recovery planning should take place on an inter-jurisdictional basis, and land managers and elected officials should work together to ensure the grizzly bear recovery area will support the long-term persistence of grizzly bears.

## 9. Set priorities

Grizzly bear recovery in Alberta will be a long and expensive process. It is essential that recovery efforts be focused on those population units at the highest risk of decline and extirpation.

The government's own research indicates that the Swan Hills population unit is the most at risk. The rescue and recovery of this population unit will require immediate and dramatic intervention. It will require population augmentation, habitat restoration (i.e. the decommissioning of roads) and the restoration of connectivity to the Grande Cache population if it is to survive.

The Yellowhead and Clearwater population units are also small and relatively isolated. Although habitat in the western portion of these management units is relatively secure, the central and eastern parts are heavily impacted, and human disturbance is expected to increase significantly over the next 30 years. These population units will also require immediate and dramatic intervention.

## 10. Start now

It has been eight years since the Endangered Species Conservation Committee recommended that Alberta's grizzlies be listed as a threatened species and 20 years since the 1990 grizzly bear management plan recognized the plight and peril facing Alberta's grizzly bear population. And yet little has been done to make Alberta a safer place for grizzlies. During the same period, our American neighbours have been able to significantly recover not one but two populations of grizzly bears that live in similar habitats and similar socio-economic contexts as Alberta's bears. There's no more room for excuses. It's time to get busy.



## CONCLUSION



There is no reason Albertans can't enjoy a strong economy *and* the multifarious benefits of a healthy environment complete with a sustainable population of grizzly bears.

Photo John E. Macriott/wildernessprints.com

The most important words in Alberta's grizzly bear recovery plan are perhaps those found on page 20. With unusual frankness, the recovery team stated that "socio-economic priorities within government (and other agencies involved in implementation) are a challenge to timely implementation of high priority recovery actions. The [Recovery] Team recognizes that grizzly bear recovery is only one of multiple initiatives administered by government, and recommends incorporating grizzly bear recovery actions with other processes as much as possible to maximize net gains. Recovery success is largely contingent upon government support and action, however, the support and commitment from other agencies and organizations is key to achieving the goal of grizzly bear recovery in Alberta."<sup>164</sup>

As this passage implies, the Alberta government's emphasis on the "fullest possible economic utilization"<sup>165</sup> of Alberta's natural resources has left Alberta's grizzly bears, and those who care about them, in something of a pickle. There are relatively few grizzlies left in Alberta, and they are forced to eke out an existence on some of the most industrialized and populated landscapes where grizzly bears remain. This means mortality rates are high and reproductive rates are low, which has resulted in a slow but steady population decline in many parts of Alberta over the last decade or two.

The fact is, it is really quite amazing that we still have enough grizzlies left to even explore the question of whether or not we want to keep them around. If we do, we need to come up with a better plan for the way we manage Alberta's Eastern Slopes and boreal forest. Time is running out for the grizzly bear, but it is also the perfect time to adjust our expectations and rethink the way we manage what is left of Alberta's wilderness and wildlands.

Alberta's ongoing Land-Use Framework process provides an ideal opportunity to include the land-use strategies from a new and improved grizzly bear recovery plan into the South Saskatchewan

and other regional plans. If these plans include adequate habitat security for grizzly bears across their current range, they will have secured a future for grizzly bears well into the future – and protected other natural resources that Albertans value, including clean drinking water, healthy fisheries and abundant game species like elk.

Make no mistake: this will require some dramatic changes to the way we manage ourselves. There is always pushback when this kind of change is required of us. Too expensive. Too difficult. Too many jobs and recreational opportunities lost. The rhetoric, however, is usually quite different from the reality. In the Greater Yellowstone Ecosystem, for instance, "the grizzly bear achieved all recovery goals ... with many ongoing forest management activities. Timber sales and other vegetations management activities occurred regularly. Roads were built and roads were decommissioned. Humans continued to recreate and share the landscape with the bears."<sup>166</sup>

There is no reason Albertans can't enjoy a strong economy *and* the multifarious benefits of a healthy environment complete with grizzly bears. With the bulk of Alberta's economy focused on the development of the oil sands, it is prudent and responsible to consider safeguarding the Eastern Slopes from continued overdevelopment. Our grizzly bears (and our water) depend on it.

If the Alberta government isn't up to the task, the federal government will have no choice but to invoke the safety net clause in Canada's Species at Risk Act and step in to protect Alberta's most threatened grizzly bear population units, particularly those at risk of further decline in the Clearwater, Swan Hills and Yellowhead management areas.

Either way, it is time that all Albertans make more room for grizzly bears, both in their hearts and minds and on the landscape.



## APPENDIX I: Alberta's Grizzly Bear Population Units

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Alberta's grizzly bear population is being fragmented into seven distinct population units. Six of them are bounded on the west by the B.C.-Alberta border (which is also the continental divide south of Highway 16) and on the east by the edge of grizzly bear range (map 4). These management units are defined largely by major east-west highways that bisect the recovery area, fragmenting Alberta's grizzly bears into population units with varying levels of demographic connectivity between them. One, the Swan Hills, is essentially an island bounded by highways and ancillary human development.

### **Alberta North Grizzly Bear Population Unit/Management Area**

Composed entirely of wetlands and boreal forest, this large management area (108,007 sq. km) contains relatively unproductive grizzly bear habitat. High road and seismic-line densities—the result of industrial activity—have likely reduced habitat security below threshold levels. In the past, bear-human conflicts in and around human population centers (Grande Prairie, High Level) also have taken their toll.<sup>167</sup>

Population data on the Alberta North grizzly bear population unit is very limited. Since 2004, Gord Stenhouse of the Foothills Research Institute Grizzly Bear Program has been coordinating a DNA-based population census on behalf of the provincial government. Efforts to census this very large population unit north of Grande Prairie have been unsuccessful because biologists haven't been able to locate enough bears for a robust sample size.<sup>168</sup>

For this and budgetary reasons, the government announced in 2009 that it would not complete the DNA-based population estimate in the Alberta North population unit. Instead, a population estimate was made using Resource Selection Function (RSF) models designed as part of the population inventory. Estimates suggest the northwest corner of Alberta supports fewer than 100 grizzly bears because it is dominated by lower quality grizzly bear habitat in an area that favours black bears.<sup>169</sup>

### **Swan Hills Grizzly Bear Population Unit/Management Area**

Composed of boreal foothills and uplands, this management area has seen intensive logging and oil and gas development over the last 30 years. Although relatively productive habitat for grizzly bears, there are no significant protected areas, and high road densities as a result of industrial activity have reduced habitat security.<sup>170</sup> Poaching has been noted as a significant problem, and bear-human conflicts in and around human population centers also have taken their toll.<sup>171</sup>

Efforts to census this population unit east of Grande Prairie and northwest of Edmonton were unsuccessful.<sup>172</sup> For this and budgetary reasons, the government announced in 2009 that

it would not complete the DNA-based population estimate in the Swan Hills population unit. Instead, a population estimate was made using the Resource Selection Function (RSF) models designed as part of the population inventory. This estimate indicates that only 23 grizzly bears remained in the 22,467 square kilometre Swan Hills population unit,<sup>173</sup> which makes it one of the smallest and most isolated grizzly bear populations in North America.

### **Grande Cache Grizzly Bear Population Unit/Management Area**

At more than 48,000 sq. km, this is the largest management area in Alberta. It contains the alpine and subalpine meadows of the Rocky Mountains and the boreal forest in the foothills. The provincial DNA-based population census revealed an estimated 353 grizzly bears on approximately 19,502 sq. km of provincially and federally managed land, for an estimated average density of 18.11 bears per 1000 sq. km. Approximately half of the sampling area (9464 sq. km) is unprotected, while roughly one-quarter is provincially (5182 sq. km) or federally (4281 sq. km) protected.

Like other population units, bears were concentrated in the southwestern portion of the study area, where the landscape is relatively intact and protected as provincial or national parks. For instance, 62 bears were found in Jasper National Park (density = 14.5 bears/1000 sq. km) and 153 bears were found in Willmore and Kakwa provincial parks (density = 29.7 bears/1000 sq. km). Bear densities on unprotected provincial lands similar to those in Willmore and Kakwa were 16.2/1000 sq. km (153 total), almost half what they were in the protected portions of the provincially managed landscape. This is likely the result of increased motorized access on unprotected provincial land. Few bears were found east of Highway 40 or north of the core sampling grid (i.e. just south and east of Grande Prairie), which means more than half (~30,000 sq. km) of the population unit is likely not "occupied grizzly bear habitat" at this time.<sup>174</sup>

### **Yellowhead Grizzly Bear Population Unit/Management Area**

The provincial DNA-based population census revealed an estimated 42 grizzly bears on 8,820 sq. km of provincially and federally managed land between Hwy 16 and Hwy 11. The density estimate of 4.79 bears per 1000 sq. km is much lower than most other research projects in British Columbia and Alberta. Bears were concentrated in the west portion of the management area, close to the boundary with Jasper National Park, where road densities are lower; fewer bears were found in the eastern foothills, where road densities were higher and industrial activity more intensive.<sup>175</sup>

The provincial DNA census in this area did not include the western portion of Jasper National Park south of Highway 16, which is contiguous with the provincial census study area and contains

approximately 40 grizzly bears.<sup>176</sup> Therefore, the size of this population unit, from the Alberta-B.C. border to its eastern edge, is approximately 82 bears.

The Yellowhead population unit is 28,529 sq. km in size, with 82 bears occupying approximately 17,000 sq. km. This leaves approximately 11,000 sq. km in the eastern portion of the unit largely unoccupied by grizzly bears.

This population unit is one of the most isolated in Alberta. Proctor found that the rugged nature of the Continental Divide in this area makes it a significant barrier to female grizzly bear movement. His research indicates there is no evidence of female movement and very limited male movement across the Continental Divide between Highway 16 and Highway 11.<sup>177</sup> According to Proctor, both Highway 16 and Highway 11 appear to be barriers to female movement, leaving an increasingly isolated population in the Yellowhead population unit.<sup>178</sup>

Recent research by Dr. Scott Nielsen indicates that proposed logging activity, and the increased number of roads that will accompany it, will likely result in significant population decline in this unit over the next 50 years. If these forestry plans are implemented, grizzly bears will only be able to survive in and around Jasper National Park.<sup>179</sup>

#### **Clearwater Grizzly Bear Population Unit/Management Area**

The provincial DNA-based population census revealed an estimated 45 bears on 8,477 sq. km of provincially managed land between Hwy 11 and Hwy 1 (i.e. between Nordegg/Rocky Mountain House south to Banff/Canmore), for a density estimate of 5.25 bears/1000 sq. km. This density estimate is much lower than most other research projects in British Columbia and Alberta.

Like the Yellowhead population unit, bears were concentrated in the western portion of the management area, close to the boundary with Banff National Park, where road densities are lower. Fewer bears were found in the eastern portion of the management area, where road density was higher and industrial and other human activity more intense.<sup>180</sup>

The provincial DNA census included a small portion of Banff National Park, which is contiguous with the provincial part of the Clearwater grizzly bear population unit. However, Banff National Park is believed to contain approximately 30 grizzly bears north of Highway 1.<sup>181</sup> The population size for this population unit, from the Alberta-B.C. border to its eastern edge, is therefore approximately 75 bears. However, these bears occupy only the western portion of the population unit, leaving approximately 9,128 sq. km in the eastern portion of the unit largely unoccupied by grizzly bears.

This population unit is also relatively isolated. Proctor found that, like the Yellowhead population unit, the rugged nature of the Continental Divide in this area makes it a significant barrier to

grizzly bear movement. His research indicates there is no evidence of female movement and only limited movement of males along the Continental Divide between Highway 1 and Highway 11. Both Highway 1 and Highway 11 are also barriers to female grizzly bear movement, though efforts to build fencing and crossing structures across Highway 1 in Banff National Park have met with some success. Still, this population remains relatively isolated.

#### **Livingstone Grizzly Bear Population Unit/Management Area**

The provincial DNA-based population census revealed an estimated 90 grizzly bears on 7,647 sq. km of provincially and federally managed land between Highway 1 and Highway 3 (i.e. between Banff/Canmore and Crowsnest Pass), for a density estimate of 11.77 bears/1000 sq. km. Unlike the Yellowhead and Clearwater population units, this management area included all of occupied grizzly bear habitat between its eastern extent and the B.C.-Alberta border, which is also the Continental Divide. Like the other population units, however, more grizzly bears were found in the western and northern portions of the population unit, where there are protected areas and lower road densities.<sup>182</sup>

Unlike the population units north of Highway 1, grizzly bears in this population unit are well connected by male and female movement to the population on the other side of the Continental Divide, in British Columbia.<sup>183</sup> The Alberta population census turned up seven individuals from a population census conducted in southeastern B.C. in 1997, which indicates there is significant movement across the Continental Divide.<sup>184</sup> However, Highway 1 and Highway 3 are significant barriers to movement, especially of females. This leaves Alberta's Livingstone population unit (90 animals) connected to approximately 350 grizzly bears between Highways 1 and 3 in B.C., for a total population of approximately 440 individuals.<sup>185</sup>

#### **Waterton-Castle Grizzly Bear Population Unit /Management Area**

The Waterton-Castle grizzly bear management area in the southwestern corner of Alberta is the smallest in the province. The DNA-based population estimate for this 4000 sq. km population unit is 51, for a density of 12.75 bears per 1000 sq. km.<sup>186</sup> However, excellent connectivity between southeast B.C. and the Northern Continental Divide Ecosystem in Montana means this population unit is part of a much larger population that may include as many as 1000 grizzly bears.<sup>187</sup> This large, transboundary Crown of the Continent population unit provides a secure core area that can help maintain smaller, more threatened grizzly bear populations nearby. Restoring connectivity to the Cabinet-Yaak-Purcell population is essential to its long-term survival.

## APPENDIX 2

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### **Calculating the amount of Alberta's grizzly bear recovery area that has the potential to provide adequate habitat security under current landscape conditions.**

Although a formal habitat-security analysis has not been conducted in Alberta, publicly available research allows an estimate to be made of the amount of the current recovery area that has the potential to provide adequate habitat security.

It seems natural to assume that Alberta's national and provincial protected areas already provide adequate habitat security for grizzly bears, but this may not be the case. National parks located in Alberta contain roads, railways, townsites, ski hills, and tourism facilities that see millions of visitors every year. Many of Alberta's provincial parks and protected areas are small, unconnected and/or heavily used; some allow hunting, forestry (primarily for pine beetle control), oil and gas extraction, and other industrial activities.

An analysis by Brian Horejsi (2004) indicates that Waterton Lakes National Park (494 sq. km) boasts only 61 per cent grizzly bear habitat security, less than the 68 per cent threshold used in other jurisdictions recovering threatened grizzly bear populations.<sup>188</sup> Only sixty-five per cent (4444 sq. km) of Banff National Park's grizzly bear habitat meets or exceeds the 68 per cent target for habitat security.<sup>189</sup> Virtually all of Jasper National Park (11,228 sq. km) meets or exceeds 68 per cent habitat security.<sup>190</sup>

In the Alberta provincial portion of the Central Rockies Ecosystem, Kananaskis Country, a matrix of protected and unprotected multiple-use provincial lands, contains only 52 per cent secure habitat, while Alberta provincial lands outside Kananaskis Country contain 63 per cent secure habitat.<sup>191</sup> Kakwa Provincial Park (650 sq. km) and Willmore Wilderness Park (4,568 sq. km) are remote and see little motorized access, which likely means they both have adequate levels of habitat security. Relatively high densities of grizzly bears in the region appear to corroborate this conclusion.

To figure out how much of the current recovery area in Alberta has the *potential to provide adequate habitat security*, we used the results of an analysis by Dr. Scott Nielsen and his colleagues. Nielsen et al. (2009) identified 33,364 sq. km of "core grizzly bear conservation areas" outside protected areas south of Grande Prairie, where road densities exist at or below 0.63 km/sq. km.<sup>192</sup> If we assume that low road densities mean these areas have the *potential* to provide adequate grizzly bear habitat security, and that Jasper National Park, Kakwa Wildland Park, Willmore Wilderness Park and 65 per cent of Banff National Park do provide adequate habitat security for grizzly bears (20,890 sq. km), then only a maximum of 41 per cent (54,254 sq. km) of the recovery area

south of Grande Prairie is capable of providing adequate habitat security to maintain or recover grizzly bear populations.<sup>vii</sup>

No similar analysis has been done for the Alberta North bear management area. However, other analyses suggest it is heavily roaded, contains few intact forest landscapes, and contains only one significant protected area (802 sq. km) capable of supporting grizzly bears.<sup>193</sup> It is unlikely that more than 20,000 sq. km north of Grande Prairie (19 per cent of the Alberta North management unit) can provide adequate habitat security without significant restoration efforts (See Map 4).

If the government does maintain this portion of the Alberta North management area as a priority area, then only a maximum of 30 percent of the entire recovery area will have the potential to provide adequate levels of habitat security for grizzly bears. (See Appendix 2 for the methodology.) However, If the recovery plan were to be implemented as stated, only approximately 15 per cent of the current recovery area would provide adequate levels of habitat security.

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vii This is only an estimate. Habitat security must be measured at a much finer scale than we are able to do here, but the fact that average road densities in core areas are below threshold levels (0.6 km/sq.km) indicates these areas have the potential to provide adequate habitat security. Additional analysis at the Grizzly Bear Watershed Unit scale is required to confirm this finding.



## Notes


- 1 Kansas, J. 2002. Status of the Grizzly Bear (*Ursus Arctos*) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report No. 37, Edmonton, AB. 43 pp.
- 2 Nielsen, P.L. 1975. The Past and Present Status of the Plains and Boreal Forest Grizzly Bear in Alberta. Can. Wildlife Service Report. Edmonton, AB. 61 pp.
- 3 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Status of the Grizzly Bear (*Ursus Arctos*) in Alberta: Update 2010. Alberta Sustainable Resource Development. Wildlife Status Report No. 37 (Update 2010). Edmonton, AB. 44 pp.
- 4 Ibid.
- 5 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 6 Soulè, Michael and John Terborgh, eds. 1999. Continental Conservation. Island Press.
- 7 Ibid.
- 8 Gailus, J. 2005. Alberta's Grizzly Century. Alberta Views. Calgary, AB.
- 9 Weaver et al. 1996. Resilience and Conservation of Large Carnivores in the Rocky Mountains. Conservation Biology. 10:964-976.
- 10 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 11 Ibid.
- 12 Schwartz et al. 2006. Temporal, Spatial, and Environmental Influences on the Demographics of Grizzly Bears in the Greater Yellowstone ecosystem. Wildlife Monographs. 161:1-68.
- 13 Boyce et al. 2001. Population Viability for Grizzly Bears: A Critical Review. International Association of Bear Research and Management Monograph Series Number 4:1-45.
- 14 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 15 Ibid.
- 16 McLellan et al. 1999. Rates and Causes of Grizzly Bear Mortality in the Interior Mountains of British Columbia, Alberta, Montana, Washington and Idaho. Journal of Wildlife Management 63:911-920.
- 17 Ibid.
- 18 McLoughlin, P.D. 2003. Managing Risk of Decline for Hunted Populations of Grizzly Bears Given Uncertainty in Population Parameters. Final Report to the British Columbia Independent Scientific Panel on Grizzly Bears. University of Alberta, Edmonton. 74 pp.
- 19 Harris, 1986. Modeling Sustainable Harvest Rates for Grizzly Bears. In A.E. Dood, R.D. Brannon, and R.D. Mace, editors. Final Programmatic Environmental Impact Statement: The Grizzly Bear in Northwestern Montana. Montana Department of Fish, Wildlife and Parks, Helena, Montana. 287 pp.
- 20 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 21 Schwartz et al. 2006. Supra note xi.
- 22 Kendall et al. 2009. Demography and Genetic Structure of a Recovering Grizzly Bear Population. Journal of Wildlife Management 73:3-17.
- 23 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 24 Ibid.
- 25 Ibid.
- 26 Ibid.
- 27 Benn, B. 1998. Grizzly Bear Mortality in the Central Rockies Ecosystem, Canada. M.E.D. University of Calgary, AB. 151 pp.
- 28 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Recovery Plan No. 15. Edmonton, AB. 68 pp.
- 29 Ibid.
- 30 Ibid.
- 31 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 32 Nielsen et al. 2004. Grizzly Bears and Forestry II. Distribution of Grizzly Bear Foods in Clearcuts of West-central Alberta, Canada. Forest Ecology and Management 199: 67-82.
- 33 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 34 Nielsen, S.E. 2005. Habitat Ecology, Conservation and Projected Population Viability of Grizzly Bears (*Ursus arctos* L.) in West-central Alberta, Canada. Ph.D thesis, University of Alberta, Edmonton. 261 pp.
- 35 Benn, B. and S. Herrero. 2002. Grizzly Bear Mortality and Human Access in Banff and Yoho National Parks, 1971-98. *Ursus* 13:213-221.
- 36 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 37 Ibid. Also: Gailus, J. 2009. Bearly With Us. Westworld Magazine.
- 38 U.S. Fish and Wildlife Service. 1993. Grizzly Bear Recovery Plan. Missoula, MT. 181 pp.
- 39 Herrero, S. personal communication. February 2010.
- 40 Gibeau, M.L. 2000. A Conservation Biology Approach to Management of Grizzly Bears in Banff National Park. Ph.D. thesis, Resources and the Environment Program, University of Calgary, Calgary, AB, Canada. 129 pp.
- 41 Gibeau, M.L. et al. 2002. Grizzly Bear Response to Human Development and Activities in the Bow River Watershed, Alberta. Biological Conservation. 103:227-236
- 42 Interagency Conservation Strategy Team. 2007. Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area.
- 43 Mace, R.D. and J.S. Waller. 1997. Final Report: Grizzly Bear Ecology in the Swan Mountains. Montana Department of Fish, Wildlife and Parks. Helena, MT. 191 pp.
- 44 Mace et. al. 1996 Relationships Among Grizzly Bears, Roads and Habitat in the Swan Mountains, Montana. Journal of Applied Ecology 22: 1305-1404.
- 45 Mace, R.D. and T.L. Manley. 1993. South Fork Flathead River Grizzly Bear Project: Progress Report for 1992. Montana Department of Fish, Wildlife and Parks. Helena, MT. 34 pp.
- 46 Interagency Conservation Strategy Team. 2007. Supra note xl.
- 47 Ibid.
- 48 Schwartz et al. 2006. Supra note xi.
- 49 Kendall et al. 2009. Supra note xxi.
- 50 Meffe, G. K. and C. R. Carroll. 1997. Principles of Conservation Biology. Second Edition. Sinauer Associates, Sunderland, Massachusetts.
- 51 Ibid.
- 52 Gilpin, M. E., & M. E. Soulé. 1986. Minimum Viable Populations: Processes of Species Extinction. Pages 19-34 in M.E. Soule (editor). *Conservation biology: The Science of Scarcity and Diversity*. Sinauer Associates, Sunderland Massachusetts.
- 53 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 54 Ibid.
- 55 Kansas, J. 2002, supra note i.
- 56 Gibeau, M.L. 2000. Supra note xxxviii.
- 57 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 58 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 59 Proctor et al. 2005. Genetic Analysis Reveals Demographic Fragmentation of Grizzly Bears Yielding Small Populations. Proceedings of the Royal Society Biological Sciences 272:2409-2416.
- 60 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 61 U.S. Fish and Wildlife Service. 1993. Supra note xxxvii.
- 62 Mattson, D. J., & M. M. Reid. 1991. Conservation of the Yellowstone Grizzly Bear. *Conservation Biology* 5:364-372.
- 63 Wielgus, R. B. 2002. Minimum Viable Population and Reserve Sizes for Naturally Regulated Grizzly Bears in British Columbia. Biological Conservation 106: 381-388.

- 59 Wiegand, T. et al. 1998. Assessing the Risk of Extinction for the Brown Bear (*Ursus arctos*) in the Cordillera Cantabrica, Spain. *Ecological Applications* 68: 539-570.
- Samson, F. B. et al. 1985. On Determining and Managing Minimum Population Size. *Wildlife Society Bulletin* 13: 425-433.
- Shaffer, M. L. 1983. Determining minimum viable population sizes for the grizzly bear. *International Conference on Bear Research & Management* 5: 133-139.
- 60 U.S. Fish and Wildlife Service. 1993. Supra note xxxvii.
- 61 Merrill, T. 2005. Conservation Strategy for Grizzly Bears in the Yellowstone to Yukon Ecoregion. Yellowstone to Yukon Conservation Initiative, Technical Report #6.
- 62 Interagency Conservation Strategy Team. 2007. Supra note xl.
- 63 Merrill, T. 2005. Supra note lxi.
- 64 Ibid.
- 65 IUCN. 2001. *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 30 pp.
- 66 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 67 Letter from Premier Stelmach to the Honourable Mel Knight, Minister of Sustainable Resource Development. February 2, 2010. [http://www.premier.alberta.ca/documents/Sustainable\\_Resource\\_Development\\_Mandate\\_Letter.pdf](http://www.premier.alberta.ca/documents/Sustainable_Resource_Development_Mandate_Letter.pdf)
- 68 [www.srd.alberta.ca](http://www.srd.alberta.ca). Accessed March 3, 2010.
- 69 Henton, D. 2010 "Group wants grizzlies on threatened list, now." Edmonton Journal, March 23, 2010.
- 70 Fish and Wildlife Division. 1982. Fish and Wildlife Policy for Alberta. Alberta Energy and Natural Resources, Fish and Wildlife Division. 24 pp.
- 71 Fish and Wildlife Division. 2008. Alberta's Strategy for the Management of Species at Risk (2009-2014). Alberta Sustainable Resource Development, Fish and Wildlife Division, Edmonton, AB. 30 pp.
- 72 National Accord for the Protection of Species at Risk in Canada. 1996. [http://www.sararegistry.gc.ca/approach/strategy/accord\\_text\\_e.cfm](http://www.sararegistry.gc.ca/approach/strategy/accord_text_e.cfm)
- 73 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 74 COSEWIC 2002. COSEWIC Assessment and Update Status Report on the Grizzly Bear *Ursus arctos* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 91 pp.
- 75 Ray, J. Personal communication. February 2010.
- 76 Kansas, J. 2002, supra note i.
- 77 Alberta Forestry, Lands and Wildlife. 1990. Management Plan for Grizzly Bears in Alberta. Wildlife Management Planning Series No. 2. Edmonton, AB.
- 78 Ibid.
- 79 Ibid.
- 80 Kansas, J. 2002, supra note i.
- 81 Kansas, J. 2002, supra note i.
- 82 Stenhouse et al. 2005. Amended Report on Alberta Grizzly Bear Assessment of Allocation. Alberta Fish and Wildlife Division. 47 pp.
- 83 Kansas, J. 2002, supra note i.
- 84 Alberta Endangered Species Conservation Committee. 2002.
- 85 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 86 Gibeau, M. Personal communication. February 2010.
- 87 Letter to Jim Pissot, Defenders of Wildlife, 2010.
- 88 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 89 Ibid.
- 90 Henton, D. 2010. Supra note lxi.
- 91 McFarlane, B. L. et al. 2007. Public Perceptions of Conservation of Grizzly Bears in the Foothills Model Forest: A Survey of Local and Edmonton residents. Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre, Edmonton, AB.
- 92 Government of Alberta. 2007. Land-Use Framework Workbook Summary Report. Prepared by The Praxis Group.
- 93 The Calgary Herald. [www.calgaryherald.com](http://www.calgaryherald.com). September 23, 2009.
- 94 The Calgary Herald, March 10, 2010.
- 95 The Globe and Mail, April 2010.
- 96 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 97 Ibid. Also, Gibeau, M. Personal communication. February 2010.
- 98 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 99 Kansas, J. 2002, supra note i.
- 100 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 101 Ibid.
- 102 Nielsen, S.E. 2005. Habitat Ecology, Conservation and Projected Population Viability of Grizzly Bears (*Ursus arctos* L.) in West-central Alberta, Canada. Ph.D thesis, University of Alberta, Edmonton. 261 pp.
- 103 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 104 Ibid.
- 105 Ibid.
- 106 Ibid.
- 107 Ibid.
- 108 Ibid.
- 109 Gibeau, M and B. Bertsch. 2009. Grizzly Bear Monitoring in and around the Mountain National Parks: Mortalities and Bear/Human Encounters 1990-2008. Parks Canada. 29 pp.
- 110 Ibid.
- 111 Ibid.
- 112 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 113 Ibid.
- 114 Ibid.
- 115 U.S. Fish and Wildlife Service. 1993. Supra note xxxvii.
- Herrero, S. Personal communication. February 2010.
- 116 Yellowstone to Yukon Conservation Initiative. 1998. A Sense of Place: An Atlas of Issues, Attitudes and Resources in the Yellowstone to Yukon Ecoregion, Yellowstone to Yukon Conservation Initiative. Canmore, Alberta, Canada.
- 117 Horejsi, B. 2004. Grizzly Bears in Southwest Alberta: A Vision for Population and Habitat Recovery. Castle-Crown Wilderness Coalition.
- 118 Lee P. et al. 2009. The Last Great Intact Forests of Canada: Atlas of Alberta. Global Forest Watch Canada. Edmonton, Alberta. 92 pp.
- 119 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 120 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 121 Ibid.
- 122 Ibid.
- 123 Ibid.
- 124 Ibid.
- 125 West Central Alberta Caribou Landscape Planning Team 2008. West Central Alberta Caribou Landscape Plan. For the Alberta Caribou Committee. Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 126 Ibid.

- 127 Alberta Sustainable Resource Development and Foothills Forest Products. 2009. "Appendix 6: Analysis of Forest Management Activities on Grizzly Bear Habitat in MU E8" in E-8 Forest Management Plan.
- 128 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 129 Proctor, M. Personal communication. February 2010.
- 130 U.S. Fish and Wildlife Service. 1993. Supra note xxxvii.
- 131 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 132 Stenhouse, G. Public presentation in Canmore, March 16, 2010.
- 133 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 134 Ibid.
- 135 McLoughlin, P.D. 2003. Supra note xvii.
- 136 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 137 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 138 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 139 U.S. Fish and Wildlife Service. 1993. Supra note xxxvii.  
Herrerso, S. Personal communication. February 2010.
- 140 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 141 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 142 Gailus, J. 2009. Bearly With Us. Westworld Magazine.
- 143 Ibid. Also: Alberta Sustainable Resource Development and Foothills Forest Products. 2009. Supra note cxxix.
- 144 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 145 U.S. Fish and Wildlife Service. 1993. Supra note xxxvii.  
Gailus, J. 2009. Supra cxliv.
- 146 Alberta Fish and Wildlife Division. 2005. "Appendix 9: Wildlife Guidelines for Land Use Activities in Area 3 and 4 of the Southwest Region." In *Blue Ridge Lumber Detailed Forest Management Plan*. Blue Ridge Lumber.
- 147 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 148 U.S. Fish and Wildlife Service. 1993. Supra note xxxvii.
- 149 Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Supra note ii.
- 150 Alberta Sustainable Resource Development and Foothills Forest Products. 2009. Supra note cxxix.
- 151 Blue Ridge Lumber. 2005. Blue Ridge Lumber Detailed Forest Management Plan.
- 152 Sundance Forest Industries. 2007. Forest Management Plan.
- 153 Sundance Forest Industries. 2007. "Appendix III: Grizzly Bear Habitat Analysis, MPB Harvest Plan." in Forest Management Plan.
- 154 "Efficacy of Bear Deterrent Spray in Alaska," Tom S. Smith, Stephen Herrero, Terry D. Debruyne, and James M. Wilder, *Journal of Wildlife Management*, Vol.72, Issue 3, April 2008; AND USFWS, Living with Grizzlies Fact Sheet No. 8.
- 155 "Dynamics of a small, hunted brown bear *Ursus arctos* population in Southwestern Alberta, Canada," R. B. Wielgus and F. L. Bunnell, *Biological Conservation*, Volume 67, Issue 2, 1994, Pages 161-166.
- 156 Boyce, M. Personal communication.
- 157 Mowat et al. 2005. Grizzly *Ursus arctos* and black bear *U. americanus* densities in the interior mountains of North America. *Wildlife Biology* 11:31-48.  
Banci, V. 1991. Updated status report on the grizzly bear in Canada. Committee on the Status of Endangered Wildlife in Canada.
- 158 Government of Alberta. 2008. *Land-Use Framework*.
- 159 Ibid.
- 160 Ibid.
- 161 ALCES Group. 2010. Upper Bow Basin Cumulative Effects Study.
- 162 Government of Alberta. 2008. *Water for Life Action Plan*.
- 163 Herrero, Stephen. 1994. The Canadian National Parks and Grizzly Bear Ecosystems: The Need for Interagency Management. *Int. Conf. Bear Res. and Manage.* 9(1):7-21.
- 164 Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Supra note xxvii.
- 165 Sundance Forest Industries. 2007. Forest Management Plan.
- 166 Interagency Conservation Strategy Team. 2007. Supra note xl.
- 167 Stenhouse, G. Personal communication.
- 168 Ibid.
- 169 Boulanger et al. 2009. Estimation of Grizzly Bear Population Size for the Swan Hills Management Unit Using DNA Sampling and Habitat-relative Occupancy Models. Alberta Sustainable Resource Development. October 2009.
- 170 Nielsen, S. et al. 2009. Identification of Priority Areas for Grizzly Bear Conservation and Recovery in Alberta, Canada. *Journal of Conservation Planning* 5:38-60.
- 171 Stenhouse, G. Personal communication.
- 172 Stenhouse, G. Personal communication.
- 173 Boulanger et al. 2009. Supra note clxxi.
- 174 Boulanger et al. 2009b. Grizzly Bear Population and Density Estimates for the 2008 DNA Inventory of the Grande Cache Bear Management Unit. Alberta Sustainable Resource Development. July 2009.
- 175 Boulanger et al. 2005. 2004 Population Inventory and Density Estimates for the Alberta 3B and 4B Grizzly Bear Management Area. Alberta Sustainable Resource Development. November 2005.
- 176 Gibeau, M. Personal communication. February 2010.
- 177 Proctor, M and D. Paetkau. 2004. A Genetic-based Spatial Analysis of Grizzly Bears in Alberta. Alberta Sustainable Resource Development.  
Proctor, M. Personal communication. February 2010.
- 178 Ibid.
- 179 Nielsen, S.E. 2005. Supra note cii.
- 180 Boulanger et al. 2005. Grizzly Bear Population and Density Estimates for the 2005 DNA Alberta (Proposed) Unit 4 Management Area Inventory. Alberta Sustainable Resource Development. December 2005.
- 181 Gibeau, M. Personal communication. February 2010.
- 182 Boulanger et al. 2007. Grizzly Bear Population and Density Estimates for the 2006 Alberta Unit 5 Management Area Inventory. Alberta Sustainable Resource Development. May 2007.
- 183 Proctor, M. Personal communication. February 2010.
- 184 Proctor, M. Personal communication. February 2010.
- 185 Proctor, M. Personal communication. February 2010.
- 186 Boulanger et al. 2008. Grizzly Bear Population and Density Estimates for Alberta Bear Management Unit 6 and British Columbia Management Units 4-1, 4-2 and 4-23 (2007). Alberta Sustainable Resource Development. August 2008.
- 187 Proctor, M. Personal communication. February 2010.
- 188 Horejsi, B. 2004. Supra note cxviii.
- 189 Parks Canada. 2009. Grizzly Bears: Habitat Security and Mortality Targets Parks Canada, Backgrounder – Mountain Parks.  
Gibeau, M. Personal communication. February 2010.
- 190 Ibid.
- 191 Gibeau et al. 2001. Managing for Grizzly Bear Security Areas in Banff National Park and the Central Canadian Rocky Mountains. *Ursus* 12: 121-130.
- 192 Nielsen, S. et al. 2009. Supra note clxxii.
- 193 Lee P. et al. 2009. Supra note cxix.







“ Man... has chosen to fight the wilderness blindly, attempting to break nature to his needs, at war with it and sometimes mercilessly destroying the very things he needs the most.

**The grizzly can show us something of what it means to live in harmony with nature.”**

Andy Russell, *Grizzly Country*, 1967