

THE CANADIAN NATIONAL PARKS AND GRIZZLY BEAR ECOSYSTEMS: THE NEED FOR INTERAGENCY MANAGEMENT

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Abstract: Canada's current grizzly/brown bear (*Ursus arctos*) population estimate is between 22,000 and 28,000. The grizzlies' range can be subdivided into 14 biophysically based zones. Banci (1991) classified the grizzly as extinct in 2, threatened in 1, vulnerable in 7, and secure in 4. This documents the need for future-oriented, proactive planning to protect grizzly bear populations in the face of development. Through a survey, all provinces, territories, and national parks having grizzly bears were contacted and their opinions were sought regarding grizzly bear status, threats, and the role of reserves for long-term conservation of viable grizzly bear populations. All respondents believed that the concept of a strictly protected core area and a surrounding region managed to allow limited, carefully regulated resource development, but planned to minimally impact grizzly bears, would be an important component of long-term grizzly bear conservation. I concluded that creation of a new system of such reserves for grizzly bears and other highly mobile species was unlikely. I suggest that the already established 10 national parks of Canada that have grizzly bears could form at least major parts of the strictly protected areas. At least enough land surrounding each park would need to be managed to protect grizzly bear habitat and populations so as to give a high probability of population viability. Canadian national parks by themselves only protect approximately 3.4-4.4% of Canada's grizzly bears so interagency cooperation would be necessary to protect viable populations in larger grizzly bear ecosystems. The need for and progress toward interagency management is discussed with respect to each Canadian national park having grizzly bears. Means of forming interagency management teams are identified. The legislative, policy, and managerial ability of the Canadian national parks to protect grizzly bear habitat and populations is discussed and found to be good enough to allow national parks to function as protected cores. Cooperation from territories and provinces in the management of grizzly ecosystems will depend on public support.

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In the western and northern parts of Canada grizzly bears are as much a part of Canadian culture and lore as is winter's cold and ice hockey. Yet like winter's cold, most Canadians don't want to directly experience grizzly bears, and as with hockey most of us are content to watch grizzly bears on TV, having a cold beer rather than a wild bear for a companion. Recently almost all of western and northwestern Canada, with the exception of British Columbia's (BC) coastal islands, was within grizzly bear range. Present day agricultural areas in Alberta and BC still supported grizzly bears for most of the 19th century. Only within the past 120 years or so have we wrestled these lands away from the grizzly, wolf, bison, and the Indian peoples who survived by harvesting these and other animals and the ecosystem that supported them. As part of agriculturalization and other development in this region, the grizzly bear was extirpated from the Canadian prairies, and from the area just to the north of the prairies, what Banci (1991) has classified as the non-mountainous boreal plains, and from several relatively small, settled areas in southern BC (Fig. 1).

The grizzly bear is a species that does best in productive habitat where we aren't. In the Canadian west, the mountains and forests of Alberta and British Columbia have provided impediments to taming the land and the grizzly has survived, albeit in reduced numbers and with ever more loss of habitat (Alberta Fish and Wildlife 1990, Banci 1991). In northwestern Canadian parts of the grizzlies' range, in lands

administered mainly by the Yukon and Northwest Territorial governments, the grizzly bear has done well (Banci 1991), mostly because relatively few people live there. But these lands, like the southern Canadian portions of the grizzly bear's range, hold resources. Canadians are a resource-hungry people who have and expect big warm houses, modern transportation and communication, and a vast array of consumer products. The good life in Canada is energy and materials intensive. To maintain the economy that lets us buy this lifestyle we extract every resource that is feasible from the land: oil and gas, coal, hydropower, trees, minerals, grazing, recreation, and much more. The pressures of development and the Canadian lifestyle mean increasingly less wildland, and more land managed for resource extraction.

Banci (1991) recently completed a major study of the status of grizzly bears in Canada for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). She divided part of Canada into 14 biophysically based grizzly bear zones. Grizzly bears have been extirpated from 2 zones as mentioned. Populations in 7 of the remaining 12 zones she designated as vulnerable because of a large apparent difference between current numbers and the number that might be supported by current habitat. The grizzly bear population occupying the hot, dry plateaus of southern BC she designated as threatened. Five grizzly bear zones face predicted large increases in impacts from development. She felt that the status of grizzly

Grizzly Bear Distribution in Canada



Fig. 1. Grizzly bear distribution in Canada (from Hummel 1990).

bears in 4 zones appeared relatively secure although future land-use impacts were "expected to be high" in the Arctic Coastal Plains and the Subarctic Mountains and Plains. The entire Canadian population of grizzly bears she estimated at 25,000 with a probable range of 22,000 to 28,000. The grizzly bear, which in the past has received de facto protection in nondeveloped areas, is today meeting resource development in almost all places where economic resources occur, and even the grizzly bear itself is a resource of significant economic importance. Most of Canada's estimated 25,000 grizzly bears occur in the provinces and territories on lands subject to resource development.

Canada still has the opportunity to do what wildlife planners and managers say is ideal, proactive management, planning for the long-term future of grizzly bears before crisis management is necessary.

World Wildlife Fund (WWF), Canada, has taken leadership regarding long-term planning for the future of large mammalian carnivores in Canada (Bath et al. 1988, Hummel 1990). One aspect of their proposal recommends establishing a series of Carnivore Conservation Areas (CCAs) assembled around strictly protected cores, with carefully planned development and well regulated hunting in surrounding areas. The total size of each CCA would be large enough to protect viable populations of carnivores such as grizzly bears into the foreseeable future. The total area would be managed with this as an objective.

In this paper I examine the CCA concept as a possible means for secure protection of grizzly bear habitat and populations. I place emphasis on the possible role of national parks as protected core areas for long-term grizzly bear conservation and examine the

national parks' biological, legislative, policy, and operational basis for protecting grizzly bear habitat and populations. I focus discussion on the national parks because their mandate means that they offer the most secure, long-term protection for grizzly bear habitat available in Canada. Therefore, they are natural candidates to form the cores for grizzly bear conservation within the ecosystems surrounding national parks. While some strict grizzly bear habitat protection exists in various reserves in the provinces and territories (Dueck 1990, Banci 1991), all lack the breadth of legislative protection offered by the national parks.

Because grizzly bears, especially males, have large home ranges and undergo long movements, they usually enter several management jurisdictions per year. In the Yellowstone region Knight (1981) found that grizzly bears entered an average of 4.2 different management jurisdictions per year. In the Kootenay and Yoho National Park region Raine and Riddell (1991) found grizzly bears entered up to 4 jurisdictions per year. In order for grizzly bear populations to persist, each jurisdiction that has important habitat must also have management policies compatible with grizzly bears. This establishes the need for interagency cooperation and coordination, sharing the goal of long-term maintenance of viable grizzly bear populations.

The situation in the contiguous United States provides both examples of what to avoid, allowing grizzly bear populations to become fractionated and threatened, and also how to effectively coordinate grizzly bear management among several jurisdictions. The Interagency Grizzly Bear Committee (IGBC) is an outstanding example of how cooperative and coordinated efforts can support grizzly bear populations and habitat (Tixier 1986, Strickland 1985). I examine this and other models of interagency management and their relevance for the long-term maintenance of grizzly bear populations and habitat in Canada.

I thank the persons and institutions who responded to my survey: Vivian Banci, British Columbia; Norm Barichello, Yukon; Ray Case, NWT; John Gunson, Alberta. The following persons gave information in behalf of the Canadian Parks Service (CPS): Eric Dafoe, Glacier-Revelstoke; Doug Harvey, CPS Ottawa; Barry Hughson, CPS Ottawa; Rick Kunelius, Banff; John Niddrie, Kootenay; Charlie Pacas, CPS Winnipeg; Dave Poll, CPS Calgary; John Taylor, Jasper; and the Warden Service, Waterton. Pete Clarkson, NWT, Inuvik; and Ardys Flegel, EVDS Calgary also helped substantially.

SURVEY OF AGENCIES

I sent a questionnaire regarding grizzly bear populations, mortality, habitat, and management to all jurisdictions in Canada that have management responsibilities regarding grizzly bears. Opinions regarding the possible role of CCAs and interagency cooperation were also requested. As part of the survey I contacted the federal Canadian National Parks Service, Ottawa. This office forwarded my request to the Western Regional Office, Calgary, and to the Prairie and Northern Regional Office, Winnipeg. Each of these offices replied in detail regarding the parks under their jurisdiction. As well the following individual parks also replied: Banff, Jasper, Kootenay, Waterton, and Glacier-Revelstoke. Also contacted were the Fish and Wildlife management agencies for the provinces of Alberta and British Columbia, and for the Yukon and Northwest Territories. All replied.

CARNIVORE CONSERVATION AREAS AND THE CANADIAN NATIONAL PARKS

In formulating a strategy for long-term carnivore conservation in Canada, WWF suggested that one aspect should include the establishment of a series of CCAs across Canada (Bath et al. 1988, Dueck 1990, Hummel 1990). The idea of a strictly protected core and carefully planned exploitation coupled with protection in surrounding areas has been mentioned. World Wildlife Fund also proposed to identify where potentially viable populations of large mammalian carnivores currently exist in areas relatively free from resource conflicts or native land claims. World Wildlife Fund proposed action now to protect these populations and their habitat before resource development seriously threatened them. Thus, grizzly bear management might be proactive rather than reactive. Tentative identification of some candidate areas was made (Bath et al. 1990, Dueck 1990, Hummel 1990).

In my survey I asked agencies if they believed that the CCA concept would be useful for areas under their jurisdiction. The provinces and territories all qualified their answers by stating that they have a broader mandate of maintaining grizzly bears throughout most if not all of their current habitat. Alberta supported the concept with some reserve. "The CCA concept is potentially useful to stimulate interagency discussion and joint management of large carnivores in national parks and adjacent areas (J. Gunson, Bear Biologist, Alberta For., Lands and Wildl., Fish and Wildl. Div., pers. commun.)." Alberta also stated, "This process

will potentially identify corridor areas adjacent to national parks where additional protection of large carnivores is required to maintain park populations." British Columbia did not support the concept because it would not "maintain the diversity present among grizzly bears (V. Banci, Carnivore Management, B.C. Minist. of Environ., Wildl. Branch, pers. commun.)." (It wasn't intended to do this.) The Yukon supported the principle of the concept—a protected core and a carefully managed surrounding area—but it felt it would be difficult to apply except around Kluane National Park (N. Barichello, Acting Bear Biologist, Yukon Renewable Resources, pers. commun.). Other areas meriting protection regarding grizzly bear conservation were mentioned such as the Fishing Branch/Bear Mountain Area. How this area might be protected was left open. The Northwest Territories supported the CCA concept and mentioned that the Thelon Game Sanctuary (about 50,000 km²) might be a "reasonable choice" for a core area (R. Case, Wildlife Management Biologist, Northwest Territ. Dep. of Renewable Resour., pers. commun.). Other areas were identified as being under study. All of the Canadian National Parks having grizzly bears favored the CCA concept, no doubt because they saw in it the potential for maintaining grizzly bears and other mobile species.

Based on these opinions I concluded that the basic concept—a protected core area and a carefully managed surrounding ecosystem—might best be developed around national parks that have grizzly bear populations. I believe it is unlikely that large, new, strictly protected core areas in the provinces or territories will be created. With this in mind I suggest we take advantage of the protected core areas offered by existing national parks and some adjacent reserves, and try to build outward from them ecosystem management strategies based on long-term grizzly bear and other mobile species viability. The provinces and territories would gain from supporting this approach because it would provide them with a long-term supply of grizzly bears for hunting and nonconsumptive use. It would also attract new money for habitat conservation in ecosystems surrounding national parks.

POPULATION ESTIMATES FOR EXISTING AND PROPOSED NATIONAL PARKS

Figure 2 shows the location and relative size of 9 of the 10 Canadian National Parks that have grizzly bear populations. The actual area, and grizzly bear population estimate for each park, are shown in Table 1. Collectively, crude population estimates

suggest that these parks are home to a relatively small proportion of the grizzly bears in Canada: perhaps 850 out of Banci's population estimate of 25,000, or very roughly 3.4%.

The number of grizzly bears whose habitat is protected within national park boundaries in Canada would increase significantly with the addition of 2 new national parks that are in the advanced negotiation stage in the western arctic. Vuntut National Park would be a 4,800 km² area on the Porcupine River flats just south of and contiguous with Northern Yukon National Park to the north, and Alaska's Arctic National Wildlife Reserve to the west. While this new park would have hunting rights for the Inuvialuit, habitat would be strictly protected (D. Harvey, Senior Park Planner, Can. Parks Serv., pers. commun.). P. Clarkson (Wolf/Grizzly Bear Biologist, Northwest Territ. Dep. of Renewable Resour., pers. commun.), when asked to speculate how many grizzly bears might be in this area, said very approximately 40. This park is said to be nearly established (D. Harvey, Can. Parks Serv., pers. commun.). Farther east, but still in the western arctic, the Canadian Parks Service and the Inuvialuit have made substantial progress establishing a large new national park. This park would be built around the Hornaday River drainage and Bluenose Lake and would encompass approximately 33,000 km² (D. Harvey, Can. Parks Serv., pers. commun.). Grizzly bears are widely distributed throughout the area in low to moderate densities. P. Clarkson (Northwest Territ. Dep. of Renewable Resour., pers. commun.) speculated that the population might be 215. This park is in advanced stages of negotiation. With the addition of both of these national parks, approximately 4.4% of Canada's grizzly bears would occur in national parks.

While major changes in the boundaries of the existing national parks are not anticipated, one should note that Kluane and Nahanni are both classified as National Park Reserves. This designation has been used because native people's land claim settlements are still pending in these areas.

GRIZZLY BEAR MORTALITY, POPULATION TRENDS, AND GARBAGE MANAGEMENT IN THE NATIONAL PARKS

While data are not readily available, it is well known that management actions inside of parks were a major source of mortality for grizzly bears within the western Canadian national parks. The most common set of circumstances leading to grizzly bear death was bears feeding on garbage or other people's food, and thus

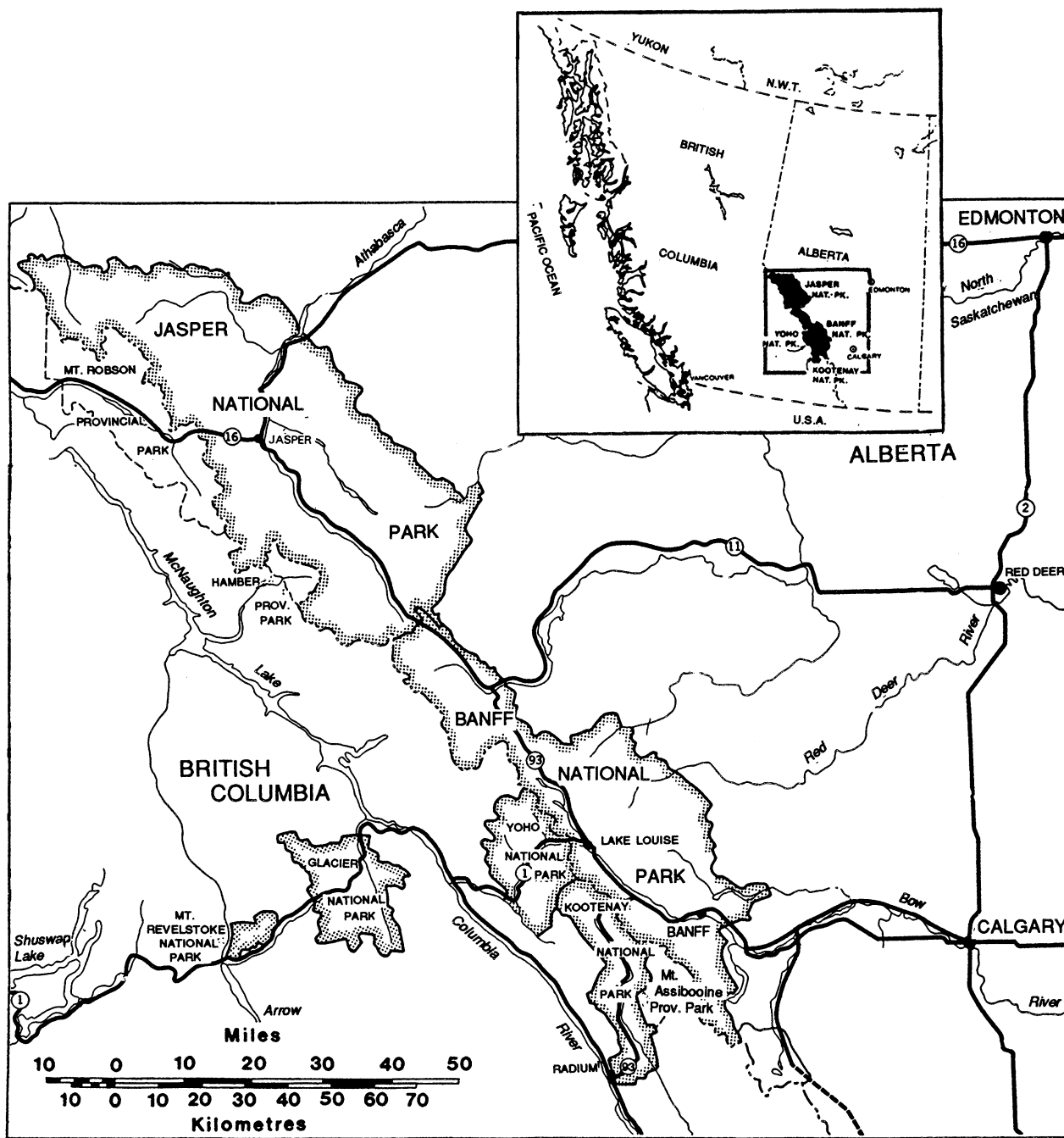


Fig. 2a. Location and relative size of 9 of the 10 Canadian national parks having grizzly bears (courtesy Canadian Parks Service).

becoming food-conditioned and habituated to people. Some of these bears then became aggressive in seeking such foods and/or became aggressive toward people. This led to grizzly bears being killed in management actions (Herrero 1970, 1985). In 1980, as a sort of

culmination of this process, a male "garbage" grizzly bear in Banff National Park injured 4 people, 1 of whom died, during a 2-week period. This event provided push to clean up the garbage in the western national parks (Herrero 1985, Westhaver 1988). Since

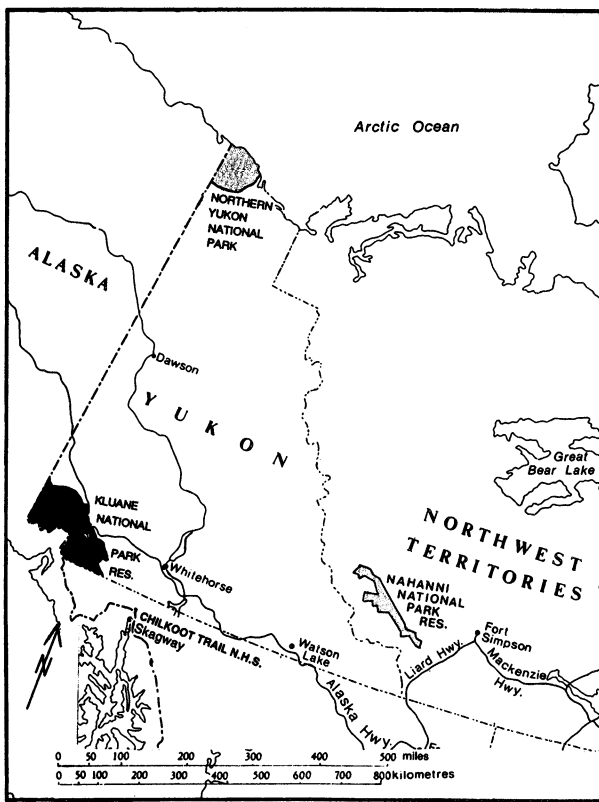


Fig. 2b. Location and relative size of 9 of the 10 Canadian national parks having grizzly bears (courtesy Canadian Parks Service).

then these parks have all developed first-rate garbage management systems and "garbage" within the western national parks no longer serves as a major attractant for bears, leading to management kills (Herrero 1985, Westhaver 1988). Few grizzly bears are now being killed for any reason inside of the western national parks (D. Poll, Reg. Wildl. Off., Can. Parks Serv., West. Reg., pers. commun.).

Mortality outside of national park boundaries almost certainly affects grizzly bear populations that spend much of their time within park boundaries. Grizzly bears, especially males, will move long distances in pursuit of resources such as food or females. Outside of national park boundaries they are exposed to legal and illegal mortality. Major population studies have been conducted in Yellowstone National Park since the late 1950s (Craighead et al. 1974), and are still continuing today (Knight and Eberhardt 1987). However, similar research has never been done in any of the western Canadian national parks. Two limited studies have, however, reached a consistent conclusion: an alarming proportion of "park" grizzly bears were

Table 1. Grizzly bear population estimates for Canadian national parks.

Park	Area (km ²)	Density (km ² /bear)	Number of bears	Source
Waterton	529	21-26	20-25	Warden service
Jasper	10,878	86-102	105-125	Russell et al. 1978
Banff	6,641	78-120	55-85	Vroom 1974
Yoho	1,313	87-113	12-15	Raine 1991
Kootenay	1,406	86-154	9-16	Raine 1991
Glacier	1,349	18-28	48-75	Mundy and Flook
Mt. Revelstoke	260	18-28	9-14	Mundy and Flook
Northern Yukon	10,179	67	151	Clarkson pers. commun.
Kluane	22,015	55-73	300-400	Hoefs 1988
Nahanni	4,766	95	50	Herrero*
Total area	59,327	Total population	857	

* Minimal estimate just for this paper.

killed by people, and much of this mortality occurred outside of national park boundaries. In Jasper National Park, Russell et al. (1979) found that 8 out of 24 known grizzly bears, 33%, died over the 3-year period of study. Seven of the 8 deaths were directly inflicted by people; the eighth was indirectly human inflicted to a cub-of-the-year as a result of the shooting death of its mother. Jasper is a large national park (10,878 km²) so this high rate of people-caused mortality is particularly alarming. This excessive mortality may have continued into the 1980s, because before 1988 Alberta's grizzly bear population was overhunted (Alberta Fish and Wildlife 1990). Jasper National Park has its long eastern and northern borders contiguous with Alberta, and grizzly bears move freely between the 2 jurisdictions (Russell et al. 1979). In fact, Alberta relies on the national parks to replenish its adjacent populations through immigration (Alberta Fish and Wildlife 1990). Since 1988, Alberta has moved to better regulate hunting and total mortality, but grizzly bear habitat remains mostly unidentified and unprotected (Alberta Fish and Wildlife 1990).

In a study of grizzly bear population parameters and ecology just completed in Yoho and Kootenay National Parks, mortality of "park" grizzly bears was found to be very high, 61-81% for subadults and 26-51% for

adults (Raine and Riddell 1991). These parks are buffered by Banff National Park to the east, but both have extensive borders adjacent to crown lands in BC where much of the mortality has occurred.

Waterton National Park is small (529 km²) and is estimated to have 20-25 grizzly bears that spend significant amounts of time within park boundaries (Warden Service, Waterton Lakes National Park, pers. commun.). Waterton has borders contiguous with several other management jurisdictions including the Provinces of Alberta, BC, and Glacier National Park in the United States. Mortality and translocation of grizzly bears occurs in nearby livestock grazing lands in Alberta (Alberta Fish and Wildlife 1990, Gunson and Treichel 1990, Horejsi 1990). In addition extensive oil and gas exploration has occurred and continues on Alberta crown lands adjacent to the parks, and this too may be having major impact on grizzly bear populations through habitat alienation and fragmentation, illegal and legal kills, and deaths due to unsuccessful translocations (Horejsi 1990).

Glacier and Revelstoke National Parks are both small parks with respect to grizzly bear conservation (1,350 km² and 260 km², respectively). They have extensive borders along BC crown lands dedicated primarily to forestry. No studies of grizzly bear population dynamics have been conducted in either park, but "it is suspected by Canadian Parks Service staff that the grizzly population . . . is currently declining at a rate which still may be reversible if access is removed, current limited entry hunting is halted and the rate of forest removals slowed considerably . . . (E. Dafoe, Park Warden, Glacier and Revelstoke National Parks, pers. commun.)."

With regard to Canada's newest parks containing grizzly bears, those in the Yukon and Northwest Territories, grizzly bear mortality is just starting to be a problem. Study by Pearson (1975) during the late 1960s and early 1970s showed little human-caused mortality, except by legal hunting outside of today's park boundaries. Since this study was completed, the amount of garbage available to grizzly bears on Yukon Territorial lands adjacent to the park increased up to 1992. During 1990, 12 garbage-conditioned "problem" grizzly bears were destroyed at the Haines Junction Dump. One grizzly bear was destroyed during 1991 in a "control" action, and 3 grizzlies were shot illegally and died (all mortality statistics are from C. Pacas, Wildl. Manage. Off., Can. Parks Serv., Prairie and North. Reg., pers. commun.). Inside of Kluane Park, Leonard et al. (1990) reported management problems. During the 1980s in the Slims River Valley there was

a decrease in grizzly bear avoidance behavior and an increase in neutral and approach behaviors, including "serious" incidents. Management actions resulted in the death of 5 grizzly bears, 5 translocations, and area closures. In 1992, an electrically fenced landfill site was opened at Haines Junction. Grizzly bear use of this site should therefore not be a problem.

In Northwest Territorial lands adjacent to Nahanni National Park, garbage, primarily from mining operations, attracts "park" grizzly bears and this facilitates legal and illegal mortality (C. Pacas, Can. Parks Serv., Prairie and North. Reg., pers. commun.).

Only newly created Northern Yukon National Park has not reported specific problems with grizzly bear mortality in land adjacent to park boundaries, or specific problems within the park except for potential legal kills by indigenous peoples.

Survey results showed that most park managers in southern parts of Canada felt that population declines would occur in the future, whereas in the north, park grizzly bear populations were projected not to change significantly (Table 2).

LEGISLATIVE AND POLICY FRAMEWORK FOR HABITAT PROTECTION AND MORTALITY CONTROL WITHIN NATIONAL PARKS

The National Parks Act of Canada with amendments provides the legal basis for delineating boundaries and protecting lands within national parks from resource development. The act is vague regarding even broad strategic directions to achieve this goal except through the dedication clause: "The National Parks of Canada are hereby dedicated to the people of Canada for their

Table 2. Wilderness zoning in Canadian national parks.

	Percent wilderness
Waterton	88
Jasper	98
Banff	93
Yoho	85
Kootenay	92
Glacier-Revelstoke	unk
Kluane	99
Nahanni	95
Northern Yukon	100

benefit, education, and enjoyment, ...and National Parks shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations." Beginning in 1964 strategic direction has been provided through a series of policy documents. Successive revisions have placed ever greater emphasis on resource conservation (Parks Canada 1979). But resource conservation objectives exist in dynamic tension with the impacts of human use and its supporting development. Visitation has either continued to increase or remained high in the western Canadian national parks that have grizzly bears. This has been coupled with facility development in townsites such as Banff, Jasper, and Waterton, and at visitor reception centers such as Lake Louise and Field. Also, major highway and railroad upgrading have occurred. The northern national parks that protect grizzly bears are all more recent additions to the system of heritage areas. This is significant from the perspective of maintaining grizzly bears because these parks have low visitation and little development. Nor is much development planned, except possibly in Kluane.

Recent changes in the National Parks Act have significantly strengthened resource conservation, including grizzly bear conservation, within national park boundaries. Fines for illegally killing a grizzly bear may run as high as \$150,000 and be coupled with a jail sentence of up to 6 months.

Similar to the United States, a basic tool for park planning and management is a system of land-use zoning applied throughout the park. Table 3 shows that where it has been applied a large proportion of park lands have been classified as "wilderness" (This includes zone 1, special protection, as well as zone 2, wilderness.) Areas zoned as "wilderness" through an approved park management plan can only be amended

by the Minister of Environment. This is usually done after a review and public consultation process. Changes must be tabled before the House of Commons, thus subjecting them to legislative and public scrutiny (C. Pacas, Can. Parks Serv., Prairie and North. Reg., pers. commun.). Within national parks, wilderness areas can also be designated by legislation. This has not been done yet for any of the parks having grizzly bear populations (C. Pacas, Can. Parks Serv., Prairie and North. Reg., pers. commun.). Despite the large percentage of park land zoned as wilderness in the western national parks having grizzly bears, these parks all have major developments within their boundaries, and face high recreational use as mentioned. In the northern parks there is little or no development within park boundaries except for trails, although Kluane National Park is under pressure to develop its marketing image as one of North America's best wilderness recreation parks (C. Pacas, Can. Parks Serv., Prairie and North. Reg., pers. commun.). New access means and recreational forms are being studied, significant with regard to possible impact on grizzly bears.

Also, since it was established in 1973, the Federal Environmental Assessment and Review Process (EARP) has been applied to all proposed developments within park boundaries. Potential impacts upon grizzly bears figure prominently in such assessments. The main limitation is often the lack of detailed information regarding grizzly bear populations and habitats, although all of the western national parks, except Mt. Revelstoke, have had at least some scientific study of grizzly bears within their borders. While specific studies of grizzly bears have not been conducted yet in either Northern Yukon National Park, or Nahanni National Park Reserve, studies in nearby areas offer a preliminary basis for evaluating the impact of possible development (Miller et al. 1982, Nagy et al. 1983, Clarkson and Gray 1989).

Within the western national parks the primary means for grizzly bear habitat assessment related to proposed development and possible impacts is the Ecological Land Classification (ELC) (D. Poll, Can. Parks Serv., West. Reg., pers. commun.). Small-scale biophysical mapping has been carried out for all of the Western Region's parks that have grizzly bears. By using a recently developed food-habits model, importance ratings can be placed on ecosites by season (D. Poll, Can. Parks Serv., West. Reg., pers. commun.). Because of the nature of the ELC and its small scale I believe it should only be used for identification of concerns in broad planning exercises. Before development approval, field study is needed. This

Table 3. Projected percentage loss of grizzly bear populations in Canadian national parks.

	5 years	10 years	20 years	40 years
Waterton	NSC*	NSC	10-25	10-25
Jasper	--	--	--	--
Banff	--	--	--	--
Yoho-Kootenay	25+	10-25	10-25	--
Glacier-Revelstoke	NSC	NSC	10-25	25+
Kluane-Nahanni-Northern Yukon	NSC	NSC	NSC	NSC

* NSC = No significant change. This category also included a range from 10% increase to 10% decrease.

approach would be consistent with that recommended for the Province of British Columbia by Fuhr and Demarchi (1990).

My opinion is that the research base is adequate in all Canadian National Parks having grizzly bears to be able to identify if a proposed development will have potential impacts on grizzly bears. After this identification is made, and if development proponents still are allowed to proceed, then detailed study, such as the one now being conducted over a 6-year period in the Alsek-Kaskawulsh Rivers of Kluane National Park Reserve (C. Pacas, Can. Parks Serv., Prairie and North. Reg., pers. commun.), may be required to more fully understand and predict possible impacts on grizzly bears and other valued ecosystem components. In the past, grizzly bear habitat and populations have been adversely affected by developments in the national parks. This is less likely to occur in the future because of wilderness zoning precluding most development, and the EAR process identifying potentially damaging developments.

The EAR process has at least 1 major potential weakness. It does not necessarily protect against cumulative impacts, each of which by itself may have minor negative effects on grizzly bears, but together they might have a significant impact. For example, in the EAR evaluation of the twinning of the Trans Canada Highway from the Banff Park gate to Sunshine Ski turnoff, the impact studies were done in 2 separate segments and consideration of cumulative impacts was not encouraged (pers. observation). However, there is increasing awareness of the potential for cumulative impacts on grizzly bears. In Banff Park a study of the cumulative impacts of the townsites has been completed (Harris 1991), thus establishing that the Canadian Parks Service is aware of cumulative impacts.

The type of impacts on grizzly bear habitat and hence populations most likely to not be detected by the EAR process, nor to be controlled by "wilderness zoning," are long-term impacts from established resource management practices such as fire suppression. Hamer and Herrero (1987) argue that fire-management policies in Banff National Park have altered the natural fire regime in the Cascade Valley thus decreasing the long-term ability of the area to support grizzly bears. The Canadian Parks Service has, however, developed a fire management plan for Banff and other parks. Through this it is attempting to mimic the effects of natural fire, and to maintain control over possible undesirable effects of wildfire by a program of controlled burning. Recently a substantial controlled burn was done in the Cascade Valley. Because of budget and scientific

constraints, I doubt whether the controlled burn policy will be able to adequately mimic the effects of natural fire with respect to grizzly bear habitat. This is an important question meriting further study and action.

Further coherence is given to grizzly bear management within the national parks because each park must have an approved bear management plan. These documents are for the most part operational guidelines spelling out in detail how grizzly bears will be managed in each park (Taylor 1984). The existence of these plans makes the process of grizzly bear management more coherent in each park. The potential exists for broader strategic directions to be addressed within the bear management plan and become an approved part of park resource management policy. Thus, issues of fire management, mortality, and habitat loss outside of parks, and federal-provincial/federal-territorial cooperation, could all be addressed.

Viewed broadly, national parks, despite recreational and development pressures, have an impressive list of reinforcing legislation, policies, and management actions that together work to maintain grizzly bear habitat and individual bears, if not populations, within boundaries of national parks.

HABITAT AND MOVEMENTS OUTSIDE OF NATIONAL PARKS

There is no such thing as a grizzly bear population that occurs exclusively within the boundaries of any Canadian National Park. Even in large parks such as Kluane and Jasper, studies have shown that adult male grizzly bears regularly leave and re-enter park boundaries (Pearson 1975, Russell et al. 1979). For example, Russell et al. (1979) found that adult males might spend spring in BC, summer in Jasper National Park, and fall in Alberta. Because of their smaller body size and different needs, adult females' home ranges are more likely to be contained completely within national park boundaries (Pearson 1975, Russell et al. 1979, Hamer and Herrero 1983).

The challenge of maintaining grizzly bears is particularly difficult in small or linear national parks where many bears spend part of their time in a national park and the remainder in nonprotected areas. This situation occurs in Yoho, Kootenay, Glacier, Revelstoke, and Nahanni National Parks. Research conducted by BC has helped Glacier and Revelstoke to identify important grizzly bear habitat in the upper Columbia watershed that surrounds the park (Simpson and McLellan 1989), but negotiation and political will are required to provide protection for these habitats.

Similar habitat studies have not been done on BC crown land adjacent to Yoho, Kootenay, Banff, or Jasper National Parks. McLellan's (1989) work in BC's Flathead Valley could be used to begin to identify important habitat adjacent to Waterton Park on the BC side.

In Alberta the recent Provincial Grizzly Bear Management Plan (1990) stresses the importance of identifying grizzly bear habitat and trying to protect it on crown lands subject to development. However, in Alberta the Fish and Wildlife budget has been reduced to the point that little research is possible. At the same time, oil and gas exploration, recreation, housing, forestry, grazing, and attendant access continue to expand on Alberta's East Slope Rocky Mountain grizzly bear habitat adjacent to the mountain parks (Horejsi 1990).

Even for Kluane and Nahanni National Park Reserves grizzly bears partly resident in parks are attracted outside by garbage or other resources, and mortality occurs.

INTERAGENCY COOPERATION AND COORDINATION BETWEEN NATIONAL PARKS AND SURROUNDING JURISDICTIONS

Everyone I communicated with, whether employed by national parks, a province, or a territory, stressed the need for interagency cooperation leading to coordinated research and management having the objective of long-term grizzly bear conservation. This is probably because everyone recognizes the impacts of ever-increasing development on lands occupied by grizzly bears in areas surrounding national parks. Thus, habitat loss, hunting pressure, defense kills, illegal kills, garbage, and improved access all place pressure on grizzly bear populations inside of national parks and in broader park ecosystems. This is especially true regarding the western Canadian national parks, but it is also happening to a lesser extent in less populated areas surrounding northern parks. In some areas there is a long-term danger of creating isolated island populations centered around national parks. To some extent this is already happening in the southern portions of Alberta and BC with respect to the Rocky Mountain national parks, and Glacier and Revelstoke. Unfortunately, if this process continues, none of the national park "habitat islands" by themselves may have enough habitat in the right configuration to support grizzly bears over the long run. Preliminary application of the concepts of minimum viable

populations and population viability analysis even suggested that the combined land area (20,160 km²) of the 4 contiguous Rocky Mountain national parks may not be enough to maintain grizzly bears over the long run if surrounding habitat in BC and Alberta is not maintained (Bath et al. 1988, Dueck 1990). All available evidence and opinion points to the need to develop effective interagency management mechanisms for grizzly bear management. To the extent that this occurs, the Canadian national parks can have a positive influence on grizzly bear conservation far exceeding the limited habitat and populations protected within park boundaries.

The group most often cited as being successful for coordinated, interagency grizzly bear management is the Interagency Grizzly Bear Committee (IGBC), which coordinates the recovery of the grizzly bear in the contiguous United States. The background to the effective function of IGBC is the grizzly bear being classified in 1975, under the federal Endangered Species Act (1973), as a threatened species throughout the United States, excluding Alaska. Under the terms of the Endangered Species Act all agencies managing federal lands, such as national forests or national parks, are required to work toward the recovery of species classified as threatened or endangered. To implement recovery various administrative structures evolved. One of the most effective has been the IGBC, which was created in 1982 to coordinate management and research to ensure the best utilization of available resources focussed on grizzly bear recovery in the states of Montana, Wyoming, Idaho, and Washington. The IGBC was formally established by signing of a Memorandum of Understanding by the governors of the 4 states, the Assistant Secretary of Agriculture, and the 2 Assistant Secretaries of the Department of Interior (Tixier 1986). The IGBC was composed of top-level managers from participating agencies. Members were regional directors from the U.S. Fish and Wildlife Service and National Park Service, 3 regional foresters, 1 representative from the Montana State Bureau of Land Management, and wildlife agency directors from Idaho, Montana, Washington, and Wyoming. British Columbia has been added as a full member. There were also ex-officio members and a wide range of invited participants. Sub-committees composed of mid-level managers from member agencies were established to deal with specific research and management issues. Through periodic meetings IGBC has worked toward the recovery of the grizzly bear in the contiguous United States through a program of coordinated research and management (Tixier 1986,

Strickland 1985).

As mentioned, there is agreement regarding the desirability of increased interagency cooperation and coordination related to grizzly bear management in national park areas and surrounding provincial or territorial lands in Canada. Where and how to move ahead are important questions. Table 4 gives my personal rankings of national parks in terms of degree of threat to grizzly bear populations, and long-term conservation potential. My rankings were derived from subjective evaluation of survey responses. There is an obvious inverse correlation between the 2 rankings. An exception is Nahanni National Park, which currently is not severely threatened, but also does not have high conservation potential because of its relatively small size and its long, linear shape. Priority for action across all the parks depends on whether reactive or proactive management strategies are being followed. Ideally all parks could move toward interagency ecosystem management simultaneously but for different reasons.

Progress toward interagency management will depend upon understanding constraints and opportunities. One of the biggest challenges to progress is the lack of a common mandate. In Canada there isn't a federal endangered species act, nor is one likely. This is because the provinces and territories have most responsibility for wildlife management. Effective endangered species legislation would therefore have to occur at provincial and territorial levels. None of these jurisdictions currently have, nor immediately contemplate, such legislation. Lacking this, the provincial/territorial commitment to grizzly bear conservation is less firm than if it were mandated by law. If we assume that lack of endangered species legislation reflects the public's attitude, then change will only come as more people find value in wildlife species such as grizzly bears and support conservation.

People's attitudes and their reflection in legislation and policy are important factors limiting grizzly bear populations in Canada today.

If endangered species legislation existed at provincial and territorial levels one could argue that the grizzly bear population in Alberta, estimated at only 630 on provincial lands (J. Gunson, Alberta For., Lands and Wildl., Fish and Wildl. Div., pers. commun.), would at least be classified as vulnerable, and more likely as threatened. In BC there are many more grizzly bears, but in at least one biophysical region, the Hot Dry Plateaus, Banci (1991) presents evidence that the grizzly bear should be classified as threatened by the federal/provincial/nongovernment organization (NGO) Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Such classification, however, carries no force of legislation requiring that the situation be addressed. The Alberta and BC examples suggest that while endangered species legislation mandating recovery of classified species would help grizzly bear conservation in these places, such legislation is not likely to evolve. I believe this is because of the provinces' significant commitment to short-term economic development.

Therefore, interagency management in Canada, in contrast to the United States, is not likely to grow out of a legislated mandate for the recovery of depleted grizzly bear populations. However, within Canada, there are outstanding examples of effective interagency cooperation in wildlife management. The best example did not develop from a legislated mandate. By 1982, the Beverly and Kaminuriak caribou herds, which historically were believed to have numbered about 6 million, were estimated to be down to 150,000 (Beverly and Kaminuriak Caribou Management Board 1988). These caribou were a critical resource to more than 10,000 people of 5 different cultures, in the NWT, northern Saskatchewan, and Manitoba. Cooperation among users and managers was deemed essential to allow the caribou to recover and serve user needs. The Beverly and Kaminuriak Caribou Management Board (BKCMB) was formed in 1982 (Payne and Goulden 1982). The board is composed of 13 members, 8 representing various traditional user groups and 5 representing the governments of Canada, Manitoba, the NWT, and Saskatchewan (Canadian Wildlife Service 1989). Two, recent, independent evaluations of the board's function were very favorable, pointing to coordinated research and management efforts, the production of a long-term caribou management plan, and extensive public education work. As tangible evidence of success the herds are now estimated to

Table 4. The need for interagency management.

Rank order for action	Based on conservation potential	Based on degree of threat
1	Kluane	Glacier-Revelstoke
2	Northern Yukon with Vuntut extension	Waterton
3	Rocky Mountain parks	Rocky Mountain parks
4	Waterton	Kluane; Nahanni
5	Nahanni	Northern Yukon
6	Glacier-Revelstoke	

number between 510,000 and 800,000 (BKCMB 1988).

CURRENT STATUS OF INTERAGENCY MANAGEMENT IN THE CANADIAN NATIONAL PARKS AND SURROUNDING REGIONS

In Canada the National Parks Act requires that park natural resources be maintained unimpaired for future generations. In order to do this with respect to wildlife species such as grizzly bears and caribou, which range over large areas, national park managers have sought to work cooperatively with provincial/territorial land and wildlife managers in nearby jurisdictions. Canadian Parks Policy (Parks Canada 1979) states that the parks will cooperate with other levels of government, private organizations, and individuals responsible for the planning of areas adjacent to national parks. Efforts and successes have been modest, but the widespread awareness of the need to expand cooperation and coordination identifies the potential.

Interagency cooperation and coordination in grizzly bear management is evolving with respect to most Canadian national parks and surrounding jurisdictions. In Glacier and Revelstoke Parks in BC the "referral" process allows these parks to comment on proposed development-resource extraction (mostly forest cutting) in surrounding BC crown land. The parks reported that the referral process has been improving over the 4 years of involvement with it, but short-term economic issues usually prevail unless well-documented critical habitat is included (E. Dafoe, Glacier and Revelstoke National Parks, pers. commun.). Moreover, the park's perception, as mentioned, was that population declines will soon occur unless management changes are made for BC crown lands (E. Dafoe, Glacier and Revelstoke National Parks, pers. commun.). Here the extent of interagency cooperation and coordination needs to be greatly expanded to reach a common perception regarding grizzly bear status and importance. Public support and probably pressure will be essential for progress.

In 1988, the BC Ministry of Environment, and the Canadian Parks Service signed a Letter of Understanding regarding the cooperative management of shared wildlife and freshwater fisheries resources (Dueck 1990). Under the terms of this agreement a joint committee has been formed and meets at least once a year. This agreement has encouraged the development of a cost-shared bighorn sheep research project and a joint bighorn sheep management plan (Dueck 1990). Thus, at least a tentative structure, the

joint committee, exists for expanded cooperation in grizzly bear management between BC and the Canadian Parks Service. This agreement provides a basis for interagency management regarding grizzly bears not only regarding Glacier and Revelstoke National Parks and surround, but also for all of the other Rocky Mountain national parks, as each of these shares its grizzly bears with BC.

In Waterton National Park and surround, interagency cooperation has evolved out of Canadian participation in the Northern Continental Divide Grizzly Bear Ecosystem committee (NCDGBE). Alberta is a participant and recognizes this as an important interagency grizzly bear committee (Alberta Fish and Wildlife 1990), but mortality and translocations in the ecosystem on Alberta crown lands continue to be a problem (Horejsi 1990). Interagency debate and recommendations should help to focus pressure on Alberta to ensure that it is not a mortality sink for grizzly bears within this ecosystem.

As noted, studies in Jasper and in Yoho and Kootenay demonstrated unsustainable mortality for "park" grizzly bears, with much of the mortality occurring in the surrounding provinces of Alberta and BC. This is coupled with rapid habitat loss in both provinces in areas adjacent to these parks. The need for an Interagency Grizzly Bear Committee for the Rocky Mountain national parks grizzly bear ecosystem is great, especially if the potential of this area for long-term maintenance of grizzly bears is to be attained (Bath et al. 1988, Dueck 1990, Hummel 1990). The Western Regional Office of the Canadian Parks Service has approached Alberta regarding establishing an interagency committee to address management issues (D. Poll, Can. Parks Serv., West. Reg., pers. commun.). To date Alberta has not committed itself to participate.

Interagency cooperation is also evolving for the northern national parks having grizzly bears. Regarding Kluane, an agreement was signed in 1989 between the Park Reserve and the Yukon Territorial Government (Department of Renewable Resources) establishing the Kluane Ecosystem Bear Working Group (KEBWG). Its goal is to provide effective delivery of bear management programs in the Kluane ecosystem that will ensure viable bear populations. Impact on bear habitat through development, and the placement and management of Territorial garbage dumps adjacent to the park are identified as areas of special mutual concern. The KEBWG is required to meet yearly and to prepare an annual work plan for approval, as well as a summary of bear research and management activities

in the ecosystem, and mortalities within 50 km of the park boundary, problem bear behaviors, and management concerns. This interagency bear management group has significant potential to contribute to grizzly bear conservation within the ecosystem. As currently composed it includes the 2 most important jurisdictions managing grizzly bears in the region but it does not include all jurisdictions. At some point representatives from BC and the United States will need to be added.

With regard to the newest northern park, Northern Yukon National Park, grizzly bears will probably be managed with coordination throughout the broader ecosystem because the North Slope Wildlife Management Advisory Committee was established partly to fulfill this function (C. Pacas, Can. Parks Serv., Prairie and North. Reg., pers. commun.). It is too early to tell if this group will be effective in conserving grizzly bears and their habitat beyond park boundaries, or even the extent to which the legal harvest will be regulated within the park. Because the park was established as part of the Inuvialuit Final Agreement, the Inuvialuit retain hunting rights in the park. However, all human-caused mortality in the park must remain within the grizzly bear's ability to recover (C. Pacas, Can. Parks Serv., Prairie and North. Reg., pers. commun.).

In Nahanni National Park Reserve the 1985-1989 Bear Management Plan, now out of date, commits the park to working cooperatively with the NWT, which has jurisdiction over wildlife on surrounding lands. To date nothing has happened to formalize cooperation in grizzly bear management throughout the ecosystem.

IMPLEMENTING INTERAGENCY COOPERATION AND COORDINATION

The future of the grizzly bear in the Canadian national parks and their surrounding ecosystems will depend substantially on the ability of all management agencies having jurisdiction over grizzly bears to agree on compatible population and habitat objectives and being able to implement them. Progress has been held back by the long standing, but now eroding, tradition that each agency is responsible for its own resources, independent of other agencies. In Canada the situation is further fractionated by federal-provincial/territorial relationships that are now strained to the point that a new definition of Canada and Canadian unity may have to emerge to allow us to function. Grizzly bears and their political supporters are minor players, or almost nonplayers, in this drama. Despite the possibility of

significant organizational change, major changes in federal-provincial/territorial responsibilities are unlikely regarding grizzly bears.

Today's tight financial situation will also pose challenges. All of Canada's national parks and regional offices that I contacted felt they needed a substantial budget increase just to meet current population and habitat management objectives, let alone to move into effective interagency management.

Dueck (1990) recently evaluated the potential for interagency cooperation in grizzly bear management in an area centered around Jasper, Banff, Yoho, and Kootenay National Parks. I'll call this area the Rocky Mountain Grizzly Bear Ecosystem (RMGBE). He presents extensive and convincing argument regarding the desirability of establishing effective interagency management for this area if grizzly bears are to be maintained with high probability well into the future. He suggests that the best means of proceeding is for the newly formed Western Predator Management Committee, a subcommittee of the Western Wildlife Directors Committee, to expand its mandate to become a committee dealing with carnivores, focusing on predation and conservation. The committee currently includes members from Alberta, BC, Manitoba, Saskatchewan, the Yukon, the NWT, and CWS. Dueck (1990) suggests that at least 1 representative from the Canadian Parks Service be added. This committee could then form sub-committees delegated to deal with interagency cooperative management for grizzly bears and other carnivores in various geographical areas. Thus, a structure similar to IGBC and its sub-committees would be established. The lack of common objectives set by law, such as exists for the grizzly bear in the contiguous United States under the Endangered Species Act, would still be a handicap, but the jurisdictions would all be represented, ultimately by top level people, and would in theory at least have a common objective related to long-term maintenance of grizzly bear populations.

Another means to forward the evolution of interagency cooperation and coordination would be for the Canadian Parks Service, perhaps in partnership with NGOs such as WWF Canada, to assume leadership and invite the provinces/territories to discuss and develop a Memorandum of Understanding related to interagency cooperation in grizzly bear management. The annual Federal-Provincial Wildlife Conference could provide an appropriate venue for such a meeting.

If major attempts such as the foregoing fail to establish interagency cooperative mechanisms related to grizzly bear management then such direction will

probably grow at more local, less powerful levels, such as have been described as already happening. In my opinion the need is so strong that some coordinating mechanism must evolve.

In any case, money and a supportive public will be needed to allow these new interagency grizzly bear management initiatives. Start up money and encouragement may have to come from NGOs.

CONCLUSIONS

Canada still has substantial numbers of grizzly bears. However, increasing demands on habitat, combined with human-caused mortality, has resulted in grizzly bear populations becoming vulnerable, threatened, or extirpated in the southern portion of the bear's Canadian range (Banci 1991).

In examining options for long-term protection of grizzly bear habitat and populations the concept of a strictly protected core zone, and a periphery managed to protect habitat and maintain populations, but with carefully regulated hunting and resource development, had widespread support. Such protected areas would offer greater security than grizzly bears probably would have in other provincial and territorial lands, but they would only form 1 element in the provinces' and territories' broader approach to grizzly bear management. After examining options I concluded that the Canadian national parks that have grizzly bears would offer the most secure protected cores because they have a variety of legislative, policy, and operational supports.

Within park boundaries the function of the protected core is diluted by the need to cater to recreational development and use. In the past this has caused serious conflict with grizzly bears (Herrero 1970, 1985, Leonard et al. 1990). However, the impacts of human use and development are now better managed through a combination of wilderness zoning for about 90% of the land base of parks having grizzly bears, and the federal EAR process having to be applied before any new development is allowed within a park. Not only is intrapark habitat protection reasonably secure, and hunting forbidden, but the national parks are where most people learn firsthand about grizzly bears. Thus, the national parks may positively influence public opinion about grizzly bears throughout their range, even though within national park boundaries relatively few grizzly bears are protected.

I have shown that national parks only protect 3-4% of Canada's grizzly bears inside of park boundaries. Some of the parks almost certainly could not maintain

grizzly bear populations without additional habitat and mortality management in surrounding ecosystems under provincial or territorial jurisdiction. These parks include Glacier-Revelstoke, Waterton, Yoho and Kootenay, and Nahanni. Even the combined, contiguous Rocky Mountain National Parks which protect an area of over 20,000 km² may not be large enough to support grizzly bears over the long run (Bath et al. 1988, Dueck 1990). The Canadian national parks in BC and Alberta that have grizzly bears all face habitat loss and potential or actual excessive mortality in the provincial lands surrounding national parks. A similar situation appears to be in an early stage of development with respect to Kluane and Nahanni National Park Reserves in the north.

I conclude that now is the time to establish interagency management for grizzly bears within the ecosystems surrounding national parks. The objective of this would be the long-term maintenance of grizzly bear populations and their habitat base. If this is done it would enhance the role of the Canadian Parks Service in long-term grizzly bear protection. This can only be accomplished with full cooperation from provinces and territories that have jurisdiction over surrounding lands. I propose this can best be done by top-level resource managers from all affected agencies signing a Memorandum of Understanding establishing a formal structure for cooperative management (Dueck 1990). Nongovernment organizations such as WWF Canada and the Canadian Wildlife Federation can both facilitate and help to finance this evolution.

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