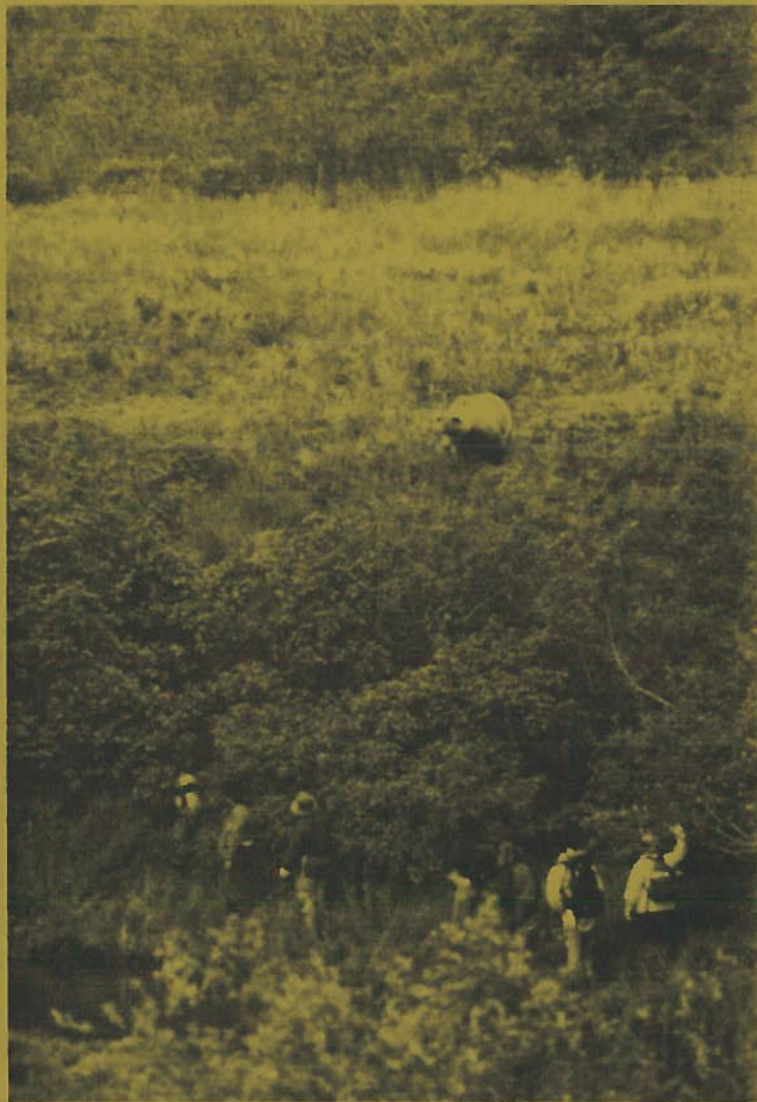


PRESERVATION & MANAGEMENT
OF THE GRIZZLY BEAR IN-
B.C. PROVINCIAL PARKS



THE URGENT CHALLENGE

PRESERVATION AND MANAGEMENT OF THE GRIZZLY
BEAR IN B.C. PROVINCIAL PARKS
THE URGENT CHALLENGE

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The statements and content of this report are the professional opinions of the authors and do not necessarily reflect the management policies of the Government of British Columbia.

ABSTRACT

The B.C. Parks system has a high value in the context of regional, provincial, national and international preservation of the grizzly bear.

The B.C. Parks and Outdoor Recreation Division administers the second largest protected land area and the highest number of parks in grizzly bear range within Canada. There are 53 provincial parks over 1000 hectares within the past and present range of the grizzly bear in B.C. Nineteen parks over 1000 hectares, representing 10% of the total park area in grizzly bear range, have lost most or all of their grizzly bear populations. There are also 89 smaller parks, under 1000 hectares, where grizzly bears occur.

B.C. Parks has implemented some positive aspects of grizzly bear-people management but these have only been applied sporadically. Overall management to provide for preservation of the grizzly bear while minimizing people-grizzly conflicts is generally inadequate.

Given the present escalation of recreational development and human visitation in provincial parks, increasing grizzly bear-people conflicts are predictable. In addition, the trend towards creating more recreation areas in wilderness and some class A parks to allow some industrial activities such as mining makes the challenge of grizzly/man management even more difficult.

5. Impact assessments related to grizzly bears be conducted of proposed industrial activities in recreation areas prior to development.
6. Food and garbage management be given much greater attention.
7. A higher priority be given to public communication and the non-consumptive appreciation of grizzly bears.
8. The consumptive use (hunting) of grizzly bears should be closed in all provincial park areas.
9. Monitoring of grizzly bears and park visitors to minimize conflicts should be up-graded. A priority should be to monitor grizzly populations and annual mortality in and around parks.
10. Co-ordinated interagency management should be implemented for parks and surrounding areas.
11. The addition of new park areas and boundary revisions should include grizzly bear considerations.
12. Recovery of grizzly bear populations should be considered for Garibaldi - Golden Ears Parks - Mt. Judge Howay Recreation Area and Manning - Cathedral Parks - Skagit Recreation Area.
13. B.C. Parks staff should receive adequate training in grizzly bear-people management.
14. Adequate funding should be provided.

PRIORITY RECOMMENDATIONS AND SUMMARY OF KEY POINTS

Although there are a many recommendations in this report, the following fourteen are those which should be given the highest priority.

1. The B.C. Parks Division should give the grizzly bear a very high management priority.

Rationale: Managing provincial parks for both people and grizzly bears is a complex challenge. To the public, the grizzly bear is a significant part of provincial park lands and one of the most important symbols of wilderness. Provincial parks are critical to the grizzly bear's long-term preservation in a provincial to international context. Because grizzly bears have a slower reproductive rate and larger home range than most other wildlife, they are very susceptible to extinction by man. Grizzly bears can thus be used as an indicator species that parks are being carefully managed. However, parks are also for people and, although attacks on humans are rare, public safety is of greater concern than for most other wildlife.

2. A comprehensive grizzly bear-people management program, based on details provided in this report, should be instituted immediately with a 3 year time frame allowed for full implementation. Within the program, priorities should be set in consultation with B.C. Parks' staff. Concerns for black bears should be incorporated into this program.

Rationale: A state-of-the-art program is urgently required to guide Division staff. In recreation areas, industrial activities have the potential to impact grizzly bears. Without an adequate program, the growing visitation associated with the trend to develop parks for recreation will have serious long-term implications for public safety, B.C. Parks' liability and grizzly bear preservation.

3. A bear specialist should be hired as the program co-ordinator for the 3 year implementation phase.

6. Food and garbage management should be given much greater attention.

Rationale: At least one garbage dump still exists in a provincial park (Muncho Lake) which caused grizzly problems in the past. Garbage dumps around parks also have the potential to create problems. Many backcountry campsites lack proper food storage facilities. Grizzly bears that become conditioned to human food and accustomed to people can be extremely dangerous.

7. Public communication and the non-consumptive appreciation of grizzly bears should be given a higher priority.

Rationale: The grizzly bear and its fascinating ecology in B.C. provincial parks should receive more emphasis in public education and other programs. Areas for safe public viewing of grizzly bears should be established. B.C. Parks staff provided many important suggestions (see pp. 154-156) which would be critical to minimizing people-grizzly conflicts. Because of the public's interest in grizzly bears this heightened emphasis on them will yield significant benefits.

8. The consumptive use (hunting) of grizzly bears should be closed in all provincial park areas.

Rationale: The grizzly bear hunting presently allowed in about 20 provincial park areas provides very limited recreational opportunity. The legal killing of a species, that represents to many members of the public a high symbol of wilderness, damages B.C. Parks' role in the preservation of this world-class species. Grizzly bears have the lowest reproductive rate of the wildlife species in parks. Unlike deer, moose and others, grizzly populations tend to be naturally self-regulating and are not known to produce "surpluses" that need to be reduced. The grizzly bear is very vulnerable to extinction by man, even in protected areas. Grizzly bears have been overhunted for well over a decade in some areas of the province that include some parks. While the theoretical annual hunting kill is low in provincial parks, such additional mortality could contribute to population declines. The importance of preservation of grizzly bears in provincial parks warrants that they be given the maximum protection possible.

Rationale: Recovery of populations to natural levels need not create unnecessary threats to public safety provided careful management is implemented at the same time. Manning-Cathedral Parks- Skagit Recreation Area are contiguous with major park and wilderness areas in the U.S. where a grizzly bear recovery program is being studied. Recovery in the U.S. cannot be achieved without recovery of this shared population in the adjoining B.C. Parks' areas. Recovery of the grizzly population would mean more complete B.C. Parks' representation of important regional landscapes.

13. B.C. Parks staff should be adequately trained.

Rationale: Many staff are not adequately informed about grizzly bears. Better training would have many benefits including being better prepared to deal with a bear incident or giving out more reliable information to the public.

14. Adequate funding should be provided to carry out an effective grizzly bear program.

Rationale: The costs of the program should be regarded as an investment in the future of the grizzly bear and visitor safety. The alternative is to continue with the status quo and, over the long-term, still end up paying for costly conflict resolution such as from locating facilities in key grizzly habitats. Poor management also costs in terms of injuries to humans and damage to bear populations. Most of the "bear attack" lawsuits against U.S. and Canadian national park agencies have resulted from the plaintiffs claiming they were not adequately warned of the grizzly bear hazard. B.C.'s public information program is seriously deficient. Other agencies such as the Wildlife Branch and Ministry of Tourism could share some of the costs of an up-graded program.

CONTENTS

Page No.	
i.	ABSTRACT
v.	PRIORITY RECOMMENDATIONS AND SUMMARY OF KEY POINTS
x.	CONTENTS
xiv.	LIST OF TABLES
xv.	LIST OF FIGURES
1.	INTRODUCTION
2.	RESULTS AND DISCUSSION
2.	<u>CHAPTER 1. THE EXISTING SITUATION</u>
3.	A. DISTRIBUTION AND ABUNDANCE OF GRIZZLY BEARS IN PROVINCIAL PARKS
7.	B. CONFLICT BETWEEN GRIZZLY BEARS AND PEOPLE
9.	C. SUMMARY OF STAFF INTERVIEWS ON GRIZZLY BEAR PRESERVATION AND MANAGEMENT IN PROVINCIAL PARKS
11.	D. PROVINCIAL, NATIONAL, AND INTERNATIONAL SIGNIFICANCE OF B.C. PROVINCIAL PARKS TO GRIZZLY BEAR PRESERVATION
11.	I. <u>PROVINCIAL SIGNIFICANCE</u>
13.	<u>POPULATION PARAMETERS</u>
13.	a) Total Park Population Size
13.	b) Can The Grizzly Bear Survive in Isolated Populations?
17.	c) The Implications to Preservation of Grizzly Bear Hunting in Provincial Parks
19.	<u>HABITAT PARAMETERS</u>
19.	a) Contribution to Protection of Provincial Grizzly Bear Range
22.	b) Contribution to the Representation of Grizzly Bears in the B.C. Parks' Regional Landscapes and Marine Environments
26.	c) Summary

- 65. c) Recommendation
- 65. 3. GRIZZLY BEAR-PEOPLE MONITORING SYSTEM
- 65. a) Other Agencies
- 65. b) B.C. Parks
- 68. c) Recommendation
- 68. 4. PUBLIC COMMUNICATIONS
- 69. a) Other Agencies
- 71. b) B.C. Parks
- 73. c) Recommendation
- 74. 5. PLANNING
- 74. a) Other Agencies
- 75. -Case Study 1. Fishing Bridge Development,
Yellowstone National Park, U.S.
- 77. -Case Study 2. Slims River, Kluane National
Park, Yukon
- 78. b) B.C. Parks
- 78. i. -Park System Plan
- 83. -Recommendation
- 83. ii. -Regional and Sub-regional Plans
- 83. iii. -Park Master plan
- 92. -Recommendation
- 92. iv. -Grizzly Bear-People Management Plan
- 93. -Recommendation
- 93. v. -Small Parks Planning
- 96. -Recommendation
- 96. vi. -Recreation Area Planning
- 97. -Recommendation
- 98. CHAPTER II THE PROPOSED SITUATION
- 99. A. GRIZZLY BEAR-PEOPLE MANAGEMENT PROGRAM FOR B.C.
PROVINCIAL PARKS
- 100. B. BACKGROUND FOR KEY ELEMENTS OF THE GRIZZLY BEAR-
PEOPLE MANAGEMENT PROGRAM
- 100. I. RECOMMENDED POLICIES
- 100. 1. Preservation policy
- 102. 2. Visitor Appreciation Policy
- 103. 3. Public Safety Policy
- 101.
- 102 II. MANAGEMENT DIRECTIVES AND RELATED OPERATIONAL
GUIDELINES
- 102 1. Program Objectives
- 104. 2. Organizational Structure
- 104. 3. Program Evaluation
- 105. 4. Grizzly Bear Preservation
- 106. 5. Co-operation between Parks and Other
Agencies Within Parks
- 106. 6. Co-ordinated Ecological System Management

LIST OF TABLES

Page No.		
4.	Table 1.	Status of grizzly bears in larger provincial park areas.
20.	Table 2.	Areas of larger protected lands in British Columbia.
24.	Table 3.	Status of grizzly bears in B.C. Parks' regional landscapes and marine environments.
29.	Table 4.	Total areas of larger protected lands in Canada's grizzly range.
32.	Table 5.	Contiguous park areas in Rocky Mountains grizzly bear ecological system.
37.	Table 6.	Representation by B.C. Parks system of Parks Canada's terrestrial and marine natural regions in grizzly bear range.
49.	Table 7.	Protected Canadian-U.S. lands in the Northern Continental Divide Ecological System.
119.	Table 8.	Kootenay National Park bear management plan. Categories of bear information for distribution to visitors.
122.	Table 9.	Kootenay National Park bear management plan. A carrion management strategy.
124.	Table 10.	Kootenay National Park bear management plan. Time/action schedule for food storage facility installations.
126.	Table 11.	Kootenay National Park bear management plan. Aversive conditioning of bears.
129.	Table 12.	Example of procedures used in Kootenay National Park to close an area when a bear hazard has been identified.
139.	Table 13.	Status of grizzly bears in larger provincial park areas over 1000 ha.
143.	Table 14.	Smaller provincial parks under 1000 ha in grizzly bear range.

- 89-91. Figures 15 Wells Gray Park master planning.
-16.
103. Figure 17. Regional planning organization indicating levels where grizzly bears must be considered.
112. Figure 18. Areas of important grizzly bear habitats used in the Valhalla master plan to plan and zone new park to minimize grizzly-people conflicts.
114. Figure 19. Example of level of detail of bear information obtained by Kootenay National Park.
117. Figure 20. Example of habitat and bear food information provided to the public in the Yukon Department of Renewable Resource's "The Bear Facts".
118. Figure 21. An example of a specific bear warning message used in the Tweedsmuir Park South pamphlet.

INTRODUCTION

The B.C. Parks and Outdoor Recreation Division (B.C. Parks) is responsible for management of grizzly bears in a large world-class park system. To date, staff has had limited information on grizzly bear management and preservation to carry out their mandate to ensure public safety and conservation of the grizzly bear. There have been concerns about the potential for growing conflicts between people and bears as park visitation continues to escalate. In addition there are concerns about grizzly bear population declines in the southern part of the province and other areas where they have been overhunted. As a result, this study was initiated by the Division under the supervision of Greg Jones, the Technical Services Biologist in Victoria, B.C.

The purposes of this contract (control no. 0101) were to:

- a) Evaluate the B.C. Parks system and individual parks with respect to:
 - status of grizzly bears
 - potential for grizzly bear-people conflicts
 - significance to grizzly bear preservation in a regional, provincial, national, and international context
- b) Interview a cross-section of B.C. Parks' staff members for their collective views on grizzly bear management and preservation.
- c) Evaluate the existing B.C. Parks' grizzly bear-people management program and compare it to relevant approaches used by 8 other park/wilderness agencies in North America.
- d) Recommend a state-of-the-art grizzly bear-people management program for B.C. Parks.

RESULTS AND DISCUSSION

CHAPTER I. THE EXISTING SITUATIONA. THE DISTRIBUTION AND ABUNDANCE OF GRIZZLY BEARS IN PROVINCIAL PARKS

Most background information for this review was extrapolated to provincial parks from the B.C. Wildlife Branch's 1979 grizzly bear management plan. More detailed information on larger provincial park areas over 1000 hectares and smaller ones under 1000 hectares is provided in tables 13 and 14 in the appendices.

Table 1. Status of grizzly bears in provincial park areas over 1000 hectares in B.C. Parks' Regions and Districts.

Region/District	EXTIRPATED		NEAR EXT.		MOD.-PLENT. DENSITIES	
	Parks	Tot.ha	Parks	Tot.ha	Parks	Tot.ha
SOUTH COAST REGION						
	5	17,885	6	364,263	-	-
SOUTH. INT. REG.						
Okanagan Dist.	4	21,682	1	33,272	1	7,513
Thompson River	-	-	-	-	1	527,307
West.Kootenay*	2	9,709	-	-	4	208,156
East Kootenay	-	-	-	-	8	137,028
Total:	6	31,391	1	33,272	14	880,004
NORTHERN REG.						
Cariboo Dist.**	1	1,247	-	-	2	1,104,237
Prince George	-	-	-	-	3	241,103
Skeena	-	-	-	-	8	1,367,646
Peace-Liard	-	-	-	-	7	361,662
Total:	1	1,247	-	-	20	3,074,648
TOTAL: 53 parks	12	50,523	7	397,525	34	3,954,652
(% of total area)		(1%)		(9%)		(90%)

*Purcell Wilderness Conservancy included in West. Koot. Dist.

**Tweedsmuir Park included in Cariboo District

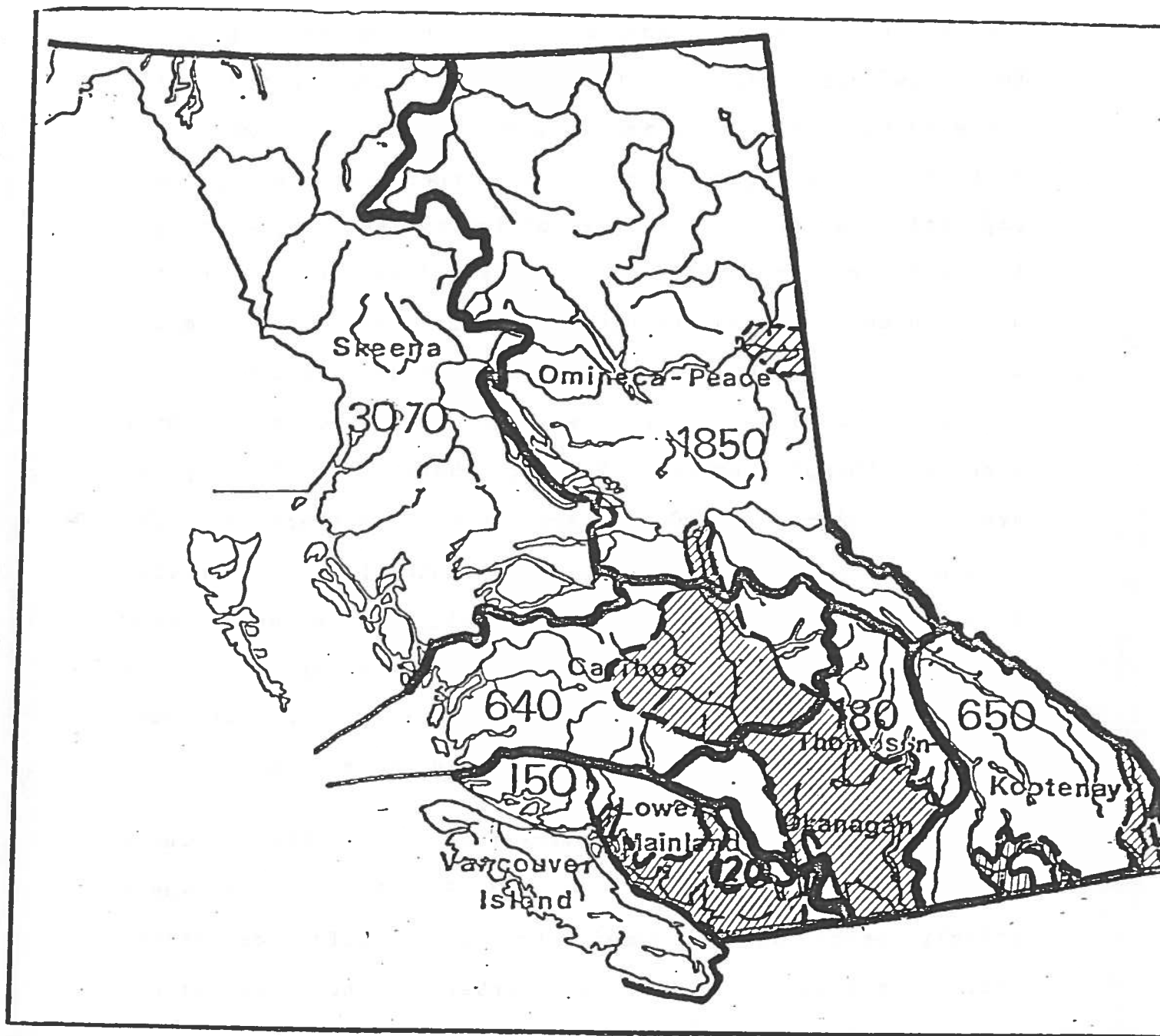


Figure 1. B.C. Wildlife Branch regional population estimates from Munro in Macéy, 1979. Cross-hatching shows large areas of province where grizzly bears have disappeared.

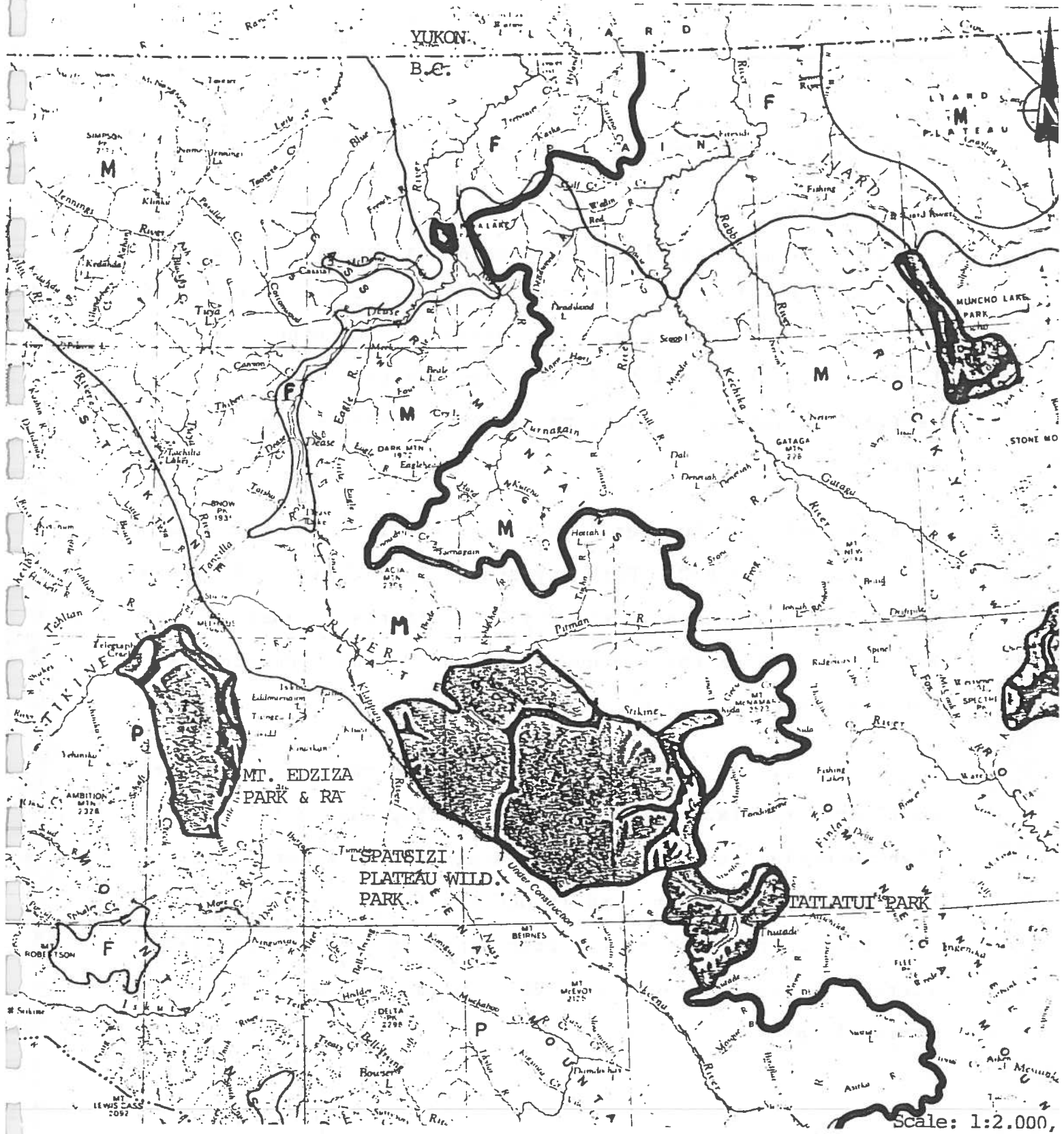


Figure 2. Part of large area of northern B.C. with moderate to plentiful densities of grizzly bears. Together, Spatsizi Plateau Wilderness and Tatlatui Provincial Parks provide the second largest protected land base for grizzly bears within the province. (Density data M=Moderate and P=Plentiful from Wildlife Branch, 1979).

C. SUMMARY OF STAFF INTERVIEWS ON GRIZZLY BEAR PRESERVATION AND MANAGEMENT IN PROVINCIAL PARKS

The following key points were given the most emphasis during interviews of 40 B.C. Parks' personnel in Victoria and two of the regions. For more details please refer to the background report (Appendix C).

1. Staff generally gave a high value to preservation of the grizzly bear in provincial parks. The grizzly was considered by some staff members to symbolize to the public the "pinnacle of the wilderness". Its vulnerability to human impacts means it is an indicator species that can be used to monitor whether or not provincial parks are being managed properly. Some felt that the grizzly bear is an internationally valuable resource that should be given priority management. They thought that greater effort was needed to ensure its preservation in provincial parks while providing for safe visitor use.
2. Some threats to grizzly bear preservation in provincial parks include cumulative impacts to populations in and around parks, excess hunter kills/poaching and increasing development in parks. Grizzlies have been almost eliminated from some areas such as Garibaldi Park and Nancy Green Recreation area.
3. Grizzly bears need to be given more consideration when new parks are added to the system or boundaries are revised.
4. The Division lacks an overall bear management program. This has led to piecemeal management. Some staff members requested a program while others preferred their own approach.
5. A variety of park areas were identified where staff were concerned about potential conflicts between people and bears: Tweedsmuir (Atnarko River), Meziadin, Monkman, Mt. Robson, Wells Gray, Monashee, Purcell Wilderness, Mt. Assiniboine, Elk Lakes, Top of the World, St. Mary's Alpine, Kokanee Glacier and large alpine parks in the north such as Spatsizi.
6. The Division should be improving public safety related to grizzly bears. It could be liable if adequate steps are not taken such as informing the public about known grizzly hazards.

D. PROVINCIAL, NATIONAL AND INTERNATIONAL SIGNIFICANCE OF B.C. PROVINCIAL PARKS TO GRIZZLY BEAR PRESERVATION

Ideally such a review should be based on a thorough knowledge of local grizzly food items and associated habitats, ecological systems, home ranges, populations and other ecological features for each B.C. provincial park area. Since such information is generally lacking, background information on grizzly bears was obtained from: interviews of 40 B.C. Parks' staff, several Parks' grizzly studies, the B.C. Wildlife Branch, and other general sources. General information on grizzly bear distribution and abundance was obtained from the Wildlife Branch's 1977 map and 1979 plan. The categories included: not present(N), few(F - 1 bear per 518 sq km), moderate(M - 1 bear per 129 sq km) and plentiful(P - over 1 bear per 52 sq km).

I. PROVINCIAL SIGNIFICANCE

The Wildlife Branch's 1979 "Preliminary Grizzly Bear Management Plan" for B.C. included the first general inventory of the grizzly bear resource ever undertaken in this vast province. The Branch concluded that:

"Grizzly bear populations have declined or were extirpated from the southern coast and parts of the interior as a result of increased man-caused mortality and the loss of habitat to urban and rural development. It is expected that the amount of grizzly bear habitat will decline in the next few years for similar reasons."

Although this report identified over-hunting as a problem and recommended a reduction in the kill, little action was taken.

POPULATION PARAMETERS

a). Total park population size

We applied the Wildlife Branch's densities to the 53 different B.C. park areas over 1000 hectares in occupied grizzly bear range (Appendix A, Table 13). The total population estimate in the B.C provincial parks system is 390 grizzly bears. Of course, this is a crude estimate. From this, the B.C. Parks system population is estimated to be 6% of the provincial population of 6600 grizzlies. The larger park areas (Table 13) with significant grizzly bear numbers are, in descending order: Tweedsmuir (76), Spatsizi (51) - Tatlatui (8), Atlin (45), Wells Gray (41), Purcell Conservancy (25) and Mt. Robson (17).

b). Can the Grizzly Bear Survive in Isolated Populations?

Populations of wild animals are often regarded as entities which can survive over the long term because they have been "saved" in preserves. However, a closer review will show that there could be problems by ONLY safe-guarding a system of protected wilderness for grizzly populations; and that such preserves by themselves may not guarantee that grizzly populations will survive and continue their natural evolution in the future. Because of the contribution that the B.C. Parks system makes to grizzly bear preservation, this has serious implications to future management strategies.

In British Columbia, this same process has occurred in the more developed areas. For example, a small "island population" occurs in the mountains between Penticton and Merritt. A relic population also occurs along the southwest border in Manning-Cathedral Provincial Parks and Skagit Recreation Area on the B.C. side and in North Cascades National Park and other wilderness areas on the U.S. side. This international population appears to be almost, if not, completely isolated.

An important question is: what population size will be necessary for the long-term survival of grizzly bears in provincial parks when populations become isolated?

Appendix F provides a comprehensive review of the topic of minimum viable population using the most recent genetic and grizzly bear population information available. Following is a summary.

A minimum viable population of any species is one which can maintain itself over a long period of time despite various disturbances such as major food crop failures, or temporary, man-induced mortality. Shaffer's 1981 definition (Appendix F) involves the smallest isolated population that has a 99% chance of remaining intact for 1000 years.

A recent simulation study (Suchy et al. 1985) for the Yellowstone population estimated the minimum viable population to be 40 to 125 bears. Neither this nor a

c) The Implications to Preservation of Grizzly Bear Hunting in Provincial Parks

During interviews of B.C. Parks' personnel, the contradictions created by allowing grizzly hunting in some provincial parks were identified. On the one hand, by allowing grizzly hunting, the Division is meeting its mandate to provide a certain type of recreation opportunity. On the other hand, the grizzly bear should receive the maximum protection possible to ensure its preservation an important symbol of wilderness. Obviously, hunting of grizzly bears in provincial parks is a contentious issue.

In view of the high values of the provincial parks system to grizzly bear preservation (as featured in later sections of this report) we are recommending that grizzly hunting be disallowed in all provincial parks.

A preliminary review (see Table 13, Appendix A) shows that hunting of grizzly bears is allowed in 20 provincial park areas (over 1000 ha). Of these, 9 are in East and West Kootenay Districts and 11 in the Northern Region. This is over half of the provincial parks where grizzly bears were still considered to occur in moderate to plentiful densities in 1977.

To compute a hypothetical annual allowable kill for grizzly bears in parks we used the Wildlife Branch's density data (1979) and an allowable kill rate of 3% as applied in the

year period, mostly because of hunter and control kills outside of the park. This is excess mortality occurred even though no hunting is allowed in Jasper, the largest park in western Canada.

-By not allowing hunting of grizzly bears in provincial parks, the Division will provide the maximum protection possible to this very vulnerable species.

-By not allowing hunting of grizzly bears, the species will receive a more appropriate recognition of its high preservation status as a world-class resource.

-By not allowing hunting of grizzly bears, the Division will have a greater credibility with the general public and international circles in its mandate to preserve grizzly bears in provincial parks.

-There is no sound evidence that hunting of grizzly bears in parks makes bears warier and helps to reduce conflicts with visitors. If it is necessary to make some bears warier of humans in parks one option would be to use aversive conditioning (e.g. rubber bullets) to treat the specific bears involved. This approach is used effectively in Katmai National Park, Alaska (Johe, pers. comm.).

2. HABITAT PARAMETERS

a) Contribution to Protection of Provincial Grizzly Bear Range

As shown in Table 2, grizzly bears occupy about 84% of the provincial land base. The unoccupied range includes the coastal islands where they have never occurred and 3 areas where they have been killed off: the lower mainland area, the dry south central interior and the area of the Peace River at Dawson Creek.

In 1979, the B.C. Wildlife Branch recognized the value of protected lands to grizzly populations:

Total area with densities of few.*	25,422,300 (Wildlife Branch 1979)	27.3	-
Total prov. park areas (over 1000 ha) where griz. still occur(41)	4,352,177	4.7	5.6
34 provincial park areas (over 1000 ha) with moderate-plent. densities.	3,954,652 (Feb./87)	4.3	5.0
7 provincial park areas (over 1000 ha) -densities of few.	397,525	.5	.6
12 provincial park areas(over 1000 ha) where grizzlies extirpated.	50,523	.1	.1
4 national parks in grizzly range.	433,175	.5	.6
Total ecological reserves.**	154,490 (1986)	.2	-
National Wildlife Areas(Canadian Wildlife Service)	2,361	-	-

* The total area where grizzlies have been eliminated has not been determined.

** Includes areas of province where grizzlies never occurred.

Of these, the 41 provincial park areas (over 1000 ha) in range still occupied by grizzly bears protect by far the largest land base (4.7%) of the entire province or 5.6% of the total area of the province's grizzly range. It is even more significant that 34 provincial parks (over 1000 ha) comprise 7.5% of the total area of the province where moderate-plentiful densities of grizzlies occur. The 4

Given this diversity, it would be expected that each landscape/marine environment should have some unique features related to grizzly bears.

Unfortunately, accurate information does not exist on grizzly bear habitats, populations and associated ecological systems in most areas of the province. However, such information would be necessary for a thorough assessment of the grizzly resource in each regional landscape/marine environment.

Lacking this, the more general data from the 1977 Wildlife Branch's map was used to determine grizzly bear distribution and abundance in each landscape/marine environment. Each was then examined for park representation (zero, partial, near-adequate, and satisfactory) and priorities for additional representation (nil, low, low-moderate, moderate and high). Sizes of representative parks, relative size of landscapes, human settlement and land use were some general factors considered. Representations in other protective designations were also considered.

We used our own judgement in changing a few of the ratings of representation of several landscapes where new parks had been added since 1982. Otherwise, the report's ratings were used despite the fact that some landscapes considered to have near-adequate representation because of smaller parks should hardly be considered near-adequate from the perspective of grizzly bear preservation. (eg. H 36, P 51 and P 52).



Figure 3. Grizzly bears never occurred on islands off the B.C. coast but some of the highest densities in Canada are found on the mainland coast. The rich grizzly bear coastal ecological system is poorly represented by the few provincial park areas that protect some of the coastal regional landscapes. (Landscape units from B.C. Parks' study, 1982)

PROVINCE'S OCCUPIED GRIZZLY BEAR RANGE. B.C. PARKS ALSO PROVIDES SIGNIFICANT REPRESENTATION OF GRIZZLY BEAR HABITATS AND POPULATIONS IN APPROXIMATELY 1/3 OF THE 45 B.C. PARKS' REGIONAL LANDSCAPES/MARINE ENVIRONMENTS WHERE GRIZZLIES OCCUR. POPULATION REDUCTIONS OR EXTIRPATIONS HAVE OCCURRED IN ABOUT 10% OF THE TOTAL AREA OF GRIZZLY BEAR RANGE PROTECTED BY PROVINCIAL PARKS.

PROVINCIAL PARKS ARE NOT LARGE ENOUGH TO ENSURE THE LONG-TERM GENETIC HEALTH OF GRIZZLY POPULATIONS SHOULD THEY BECOME ISOLATED OVER TIME.

A REVIEW OF GRIZZLY BEAR HUNTING IN 20 PROVINCIAL PARK AREAS SHOWED THAT, WHILE THE POTENTIAL KILL RATE IS LOW AND RECREATIONAL OPPORTUNITIES PROVIDED VERY LOW, OVERHUNTING IN SOME AREAS OF THE PROVINCE AND VULNERABILITY OF POPULATIONS IS A CONCERN. IT WAS RECOMMENDED THAT PRESERVATION OF THE GRIZZLY BEAR SHOULD BE GIVEN A HIGHER PRIORITY AND THAT NO HUNTING OF GRIZZLIES BE ALLOWED IN PROVINCIAL PARKS.

total numbers of grizzlies in the protected areas in Canada's grizzly bear range.

"Protected" numbers, however, should be taken in the context that some of these bears are still subject to mortality by humans. As pointed out, grizzlies are hunted in many B.C. provincial parks and grizzlies that periodically range out of provincial and national parks are also hunted or killed in control measures.

b) Contribution to Total Area of Protected Lands in Canada's Grizzly Bear Range

In estimating the total area of protected lands in Canada's grizzly range, Macey omitted a number of larger B.C. provincial parks such as Tatlatui and Manning. As well, new park areas have since been added to the B.C. system. Therefore, we conducted our own analysis. This included national parks, provincial parks, and game sanctuaries. A small Northwest Territories park was also included but some more recently created territorial parks were not (e.g. Hershel Island in the Yukon).

Fifty-five larger B.C. provincial park areas (over 1000 ha) contribute 27.5% of the total protected areas in Canada with grizzlies. The 4 national parks in B.C. contribute only 2.7% to Canada's protected grizzly range. Unfortunately, we have no information on the total area of grizzly range in Canada to make further comparison.

The total area of 19 provincial parks with diminished or extinguished grizzly bear populations comprises 2.8% of Canada's protected grizzly bear range. This is a slightly larger area than the grizzly range protected by national parks in B.C.

c) Adjoining Provincial-National Parks Grizzly Areas

In B.C. there are only two situations where provincial park areas adjoin national parks and contribute to the national value of the protected grizzly range. Both are large grizzly bear ecological systems in the Rocky Mountains.

i) Canadian Continental Divide Ecological System

We have arbitrarily chosen this name for 13 large contiguous national/provincial park areas (Figure 5).

Table 5. Contiguous Park Areas in Rocky Mountains
Grizzly Bear Ecological System

Park	Area(ha)
<u>B.C. provincial parks</u>	
-Mt. Robson	219,829
-Mt. Assiniboine	39,052
-Hamber	24,518
-Elk Lakes Park and Recreation Area	17,620
<u>Alberta provincial parks and wilderness areas</u>	
-Kananaskis Park	50,800
-Willmore Wild. Park	459,800
-White Goat Wild.	44,300
-Siffleur Wild.	41,200
-Ghost River Wild.	15,200
<u>National Parks</u>	
-Banff	664,100
-Kootenay	137,788
-Yoho	131,313
-Jasper	1,087,800
TOTAL	2,993,960 hectares

Next to the Thelon Game Sanctuary in the Northwest Territories, this is the largest protected grizzly bear ecological system or "ecotype" in Canada. The 4 B.C. provincial park areas contribute 10% of the land base of this preserved area. Using population data from Jasper National Park (Russell et al. 1979) an estimated 287-343 grizzlies could inhabit this protected ecological system. [It is noteworthy that even this large grizzly population falls short of the minimum viable population (Appendix F) necessary for the long-term genetic health of the population should it become isolated.]

ii) Northern (U.S.) Continental Divide Ecological System

This name is from Servheen (1984), and is applicable to the extreme southern Canadian Rockies. The small Akamina-Kishenina Recreation Area (10,995 ha) adjoins Waterton Lakes National Park in Alberta and both contribute to this large protected ecological system centred on Glacier Park, Montana.

d) Contribution to Representation of Canada's Natural Regions or Ecotypes

Parks Canada (1976) has identified a total of 9 terrestrial natural regions and 3 marine environments in B.C. as part of an important system of national biogeographic zones. Henwood (1985) found that B.C. provincial parks and ecological reserves contribute significantly to representation of these natural regions.

B.C. has 8 of the 14 terrestrial natural regions in Canada where grizzlies still occur (Figures 4 and 6). Also, 2 of the 3 marine natural regions where grizzlies occur in Canada are found exclusively in B.C. Thus B.C. would have the greatest diversity of grizzly bear habitats in Canada. How much do B.C provincial parks contribute to representation of these diverse natural regions?

What must first be considered is how these natural regions approximate general grizzly bear "ecotypes". Pearson (1977) considers an ecotype "a population or populations of grizzly bears displaying similar ecological characteristics such as

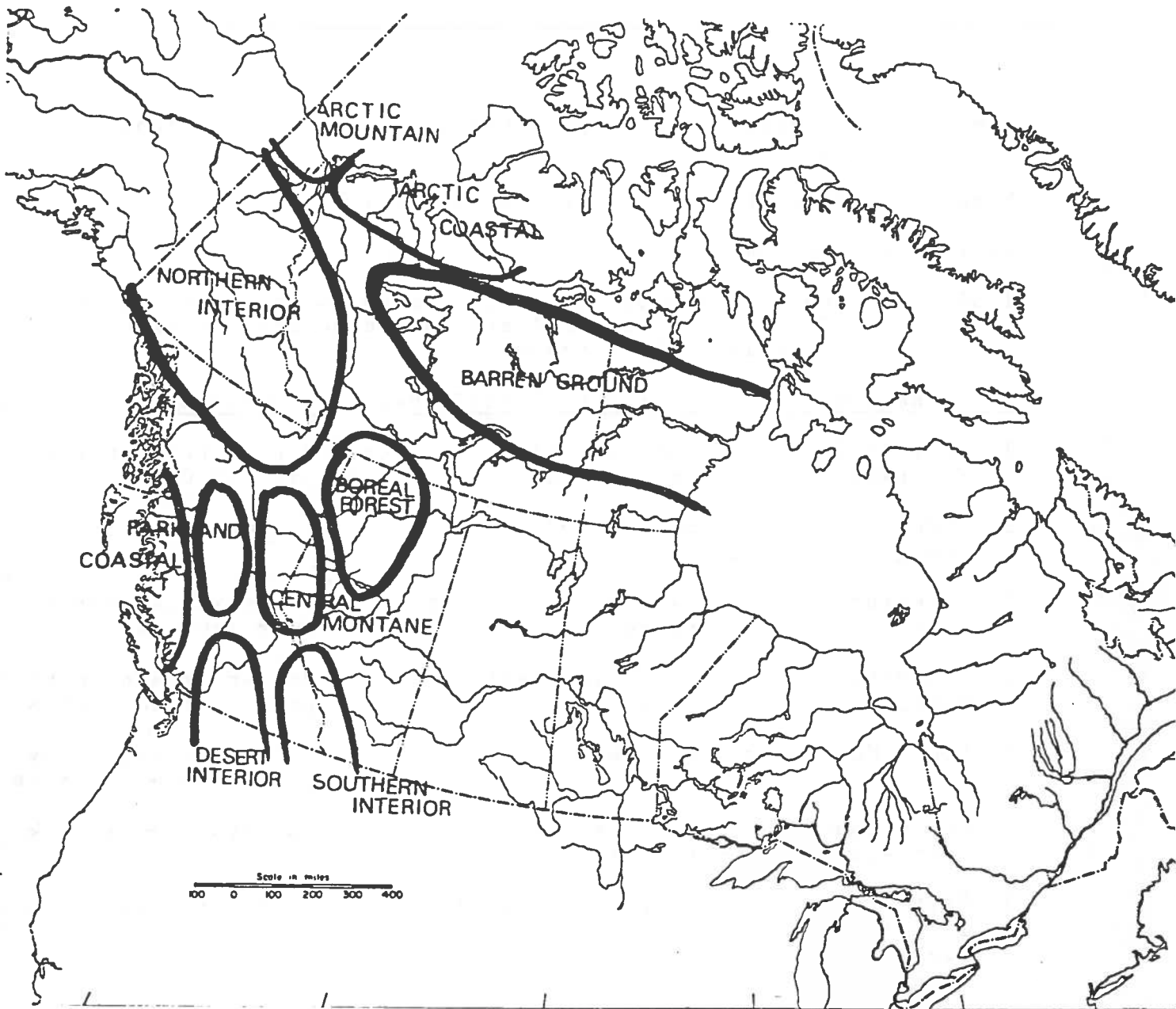


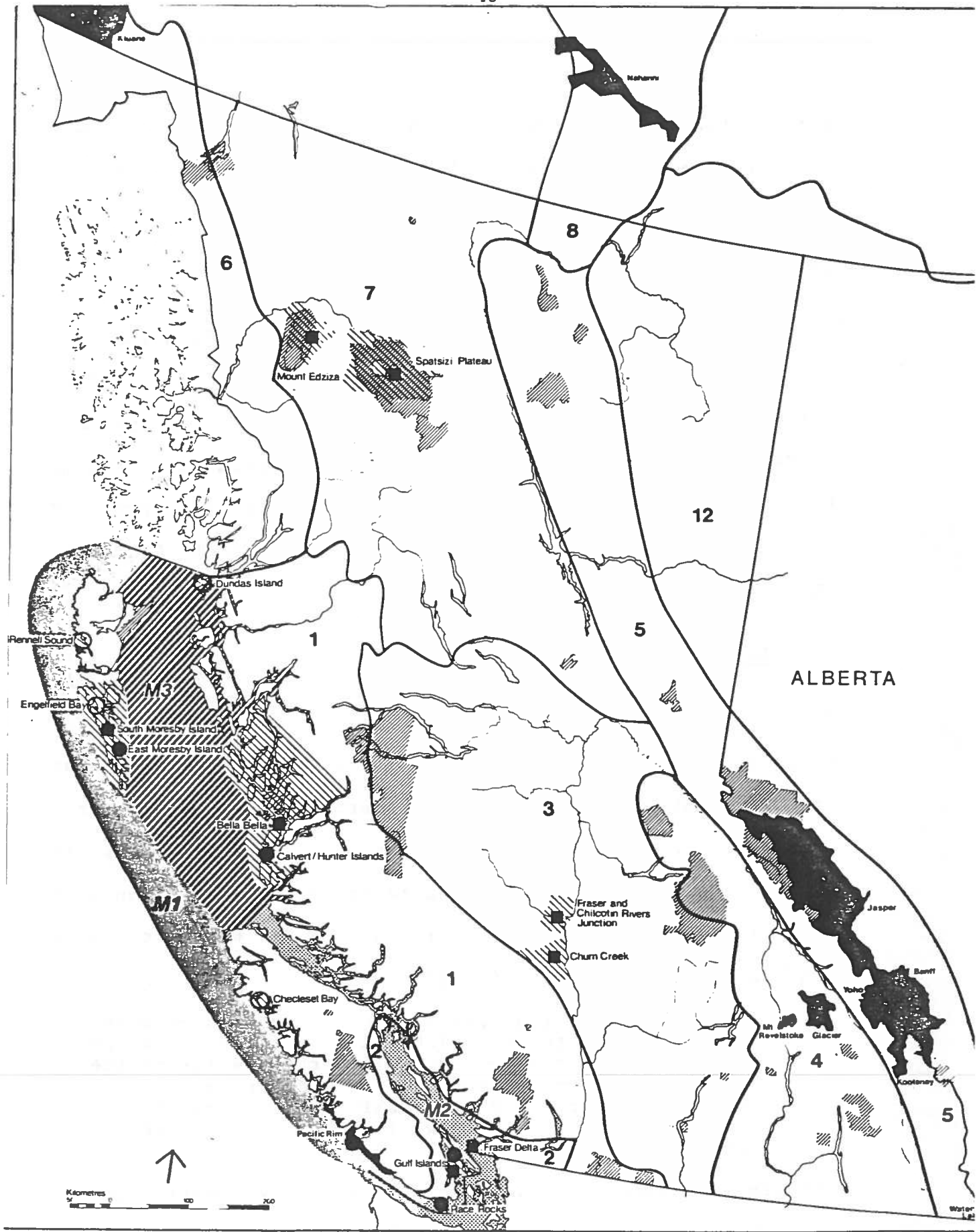
Figure 6. Grizzly bear ecotypes in Canada as defined by Pearson (1977). Parks Canada natural regions may better approximate these distinctive grizzly bear areas. A number of B.C. provincial parks provide the only representation of protected grizzly bear habitats for some of these ecotypes.

In B.C., grizzlies still occur in 8 of the 9 terrestrial natural regions. They are no longer present in the Strait of Georgia Lowlands (region 2) and in significant portions of 2 others, the Coast Mountains (region 1) and the Interior Dry Plateau (region 3). Of B.C.'s 3 marine regions, 2 are in grizzly bear range. However, grizzlies have been partially eliminated from one, the Vancouver Island Inland Sea.

As shown in Table 6, provincial parks contribute more to national representation of the grizzly bear in B.C. than national parks. Four of the 8 natural regions where grizzly bears still occur, the B.C. Parks system provides the only large representation within the province. (However, in regions 6 and 7, national parks outside of B.C. provide representation).

In two regions, B.C. provincial parks complement national parks representation of grizzly bear ecotypes. In fact, Wells Gray Provincial Park provides superior representation of the Columbia Mountains (region 4) because it is 4 times the size of Glacier National Park, and its grizzly bear range is not bisected by a major transportation corridor.

Two terrestrial regions (8 and 12) and two marine natural regions (M 2 and M 3) occupied by grizzly bears are not represented in B.C. by either the provincial or national systems. Grizzly bear populations in the large Boreal Plains



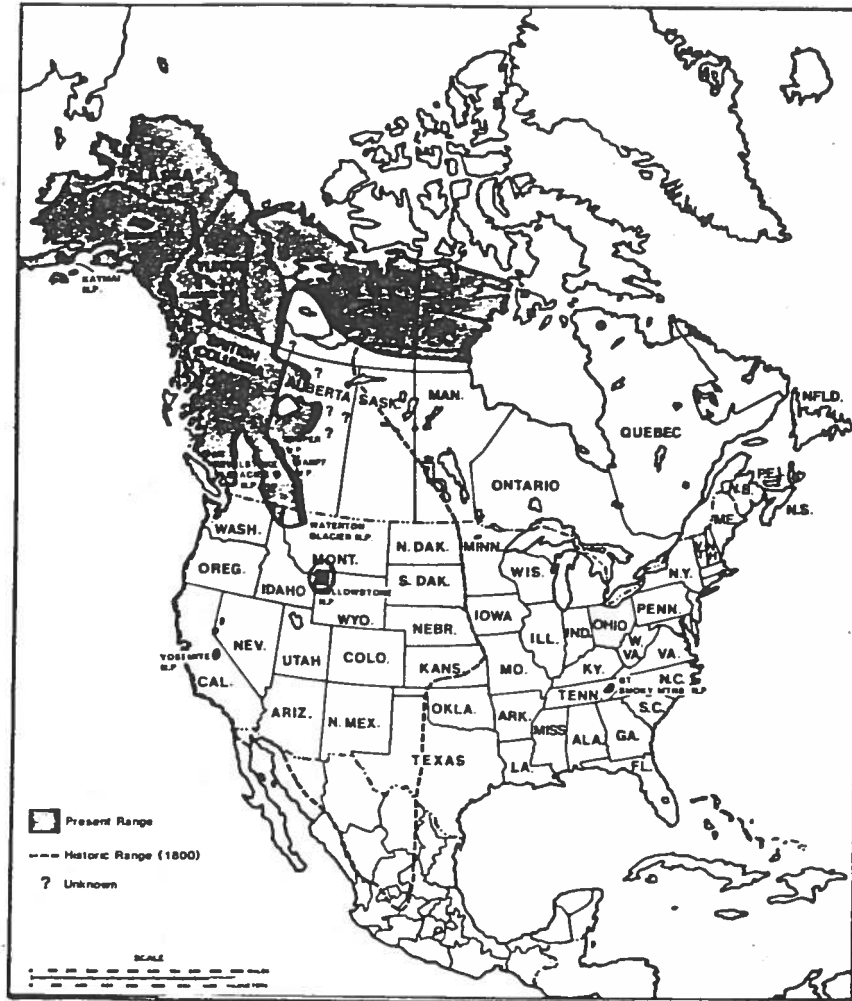


Figure 8. Circumpolar distribution of the grizzly bear (Nat. Geog. Feb./86) and North American distribution (Herrero 1985).

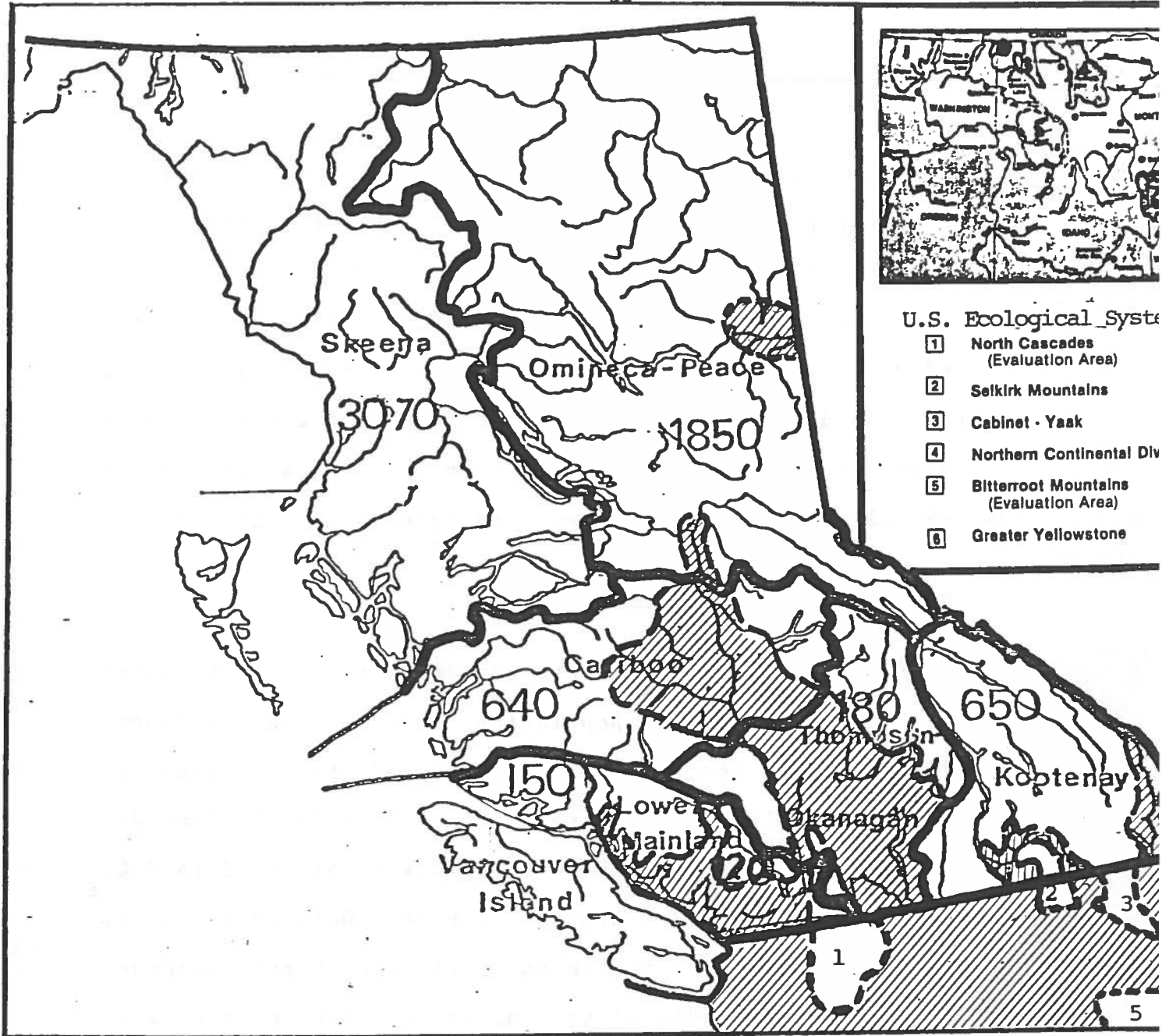


Figure 9. Showing U.S. grizzly bear ecological systems in relation to grizzly bear distribution in B.C. Recovery of the grizzly bear to natural population levels is dependent on co-operative international management involving B.C. agencies including B.C. Parks. Cross-hatching indicates zone of extirpation and white areas indicate present occurrence. Approximate population estimates are given for each Wildlife Branch region (1979).

Cascades National Park. These contiguous protected lands in Washington State cover 778,728 hectares (Almack, pers. comm.). On the B.C. side, 3 important provincial park areas are involved: Cathedral, Manning and Skagit. Their total area is 137,172 hectares. Together both countries protect a total land base of 915,000 hectares of the North Cascades ecological system (Figure 10). Here, grizzly bears may be genetically isolated from other grizzly populations. However, there could be some interchange with bears to the north across the Fraser River.

Some factors relevant to the international significance of this remnant grizzly population and its habitats in the 3 B.C. park areas along the U.S. border are:

- Grizzly habitats and populations on the B.C. side are representative of B.C. Parks' landscapes A4 and A5.
- Manning-Skagit could be a movement corridor for interactions between this fragmented population and grizzlies to the north. This might help prevent the gene pool of grizzlies in the North Cascades from becoming totally isolated and subject to in-breeding over time.
- recovery of the threatened U.S. grizzly population depends on recovery-protection in these 3 B.C. parks and surrounding areas.
- grizzlies are protected as a threatened species when they cross the border into the U.S.
- the combined size of the U.S.-Canada protected areas is substantial and larger than B.C.'s biggest provincial park.
- this international North Cascades grizzly bear ecological system would provide the southernmost representation of a coastal-interior ecotype in North America.

2. Selkirk Mountain Ecological System

On the U.S. side the population could be as low as six individuals (Servheen 1984). According to B.C. regional biologist Guy Woods (pers. comm.), higher grizzly densities are found on the B.C. side, south of Nelson. There is one small provincial park (Stagleap - 1,133 ha) near the border. It is probably not significant in terms of protecting grizzly habitat. However, because it is in a major mountain pass it could be in a grizzly bear movement corridor. Therefore, extremely diligent food and garbage management by B.C. Parks should be continued at this well-used roadside park to avoid creating conflicts with grizzlies.

3. Northern Continental Divide Ecological System

This has the largest population of the 6 U.S. ecological systems, with 440 - 680 grizzlies (Servheen 1984). We are not sure what proportion of the population is encompassed by the contiguous 1,124,604 hectares of 7 protected U.S.-Canadian parks/wilderness areas (Table 7). Although it is small, the new B.C. Parks' Akamina - Kishenina Recreation Area adds some protection of grizzly bear habitats to this large international ecological system.

Scientific Unions and 58 participating nations around the world. The goal of this program was to identify areas of both biological and physiographic importance for preservation and for future scientific and educational uses. Both natural and altered or disturbed sites were included. The objective was to establish a nationally representative network of ecological reserves.

Canada began participation in the International Biological Program in 1964. Representative wildlife species were mentioned in many of the IBP proposed ecological sites (Simpson - Lewis et al. 1979). In B.C. a total of 235 applications was presented as ecological reserves and in response to these, the B.C. Ecological Reserves Act was established in 1971. This resulted in the eventual creation of 115 reserves. While none of these have been established specifically for grizzly bears, there are a number of reserves in provincial parks that do incorporate grizzly habitats (and thus elevate their stature to an international level). However, a partial review indicates that these are generally small. There is one, however, of high significance. This is the Gladys Lake Reserve of 48,560 ha in Spatsizi Park. While it features stone sheep and mountain goats, it also includes grizzly bears and their habitats.

2. MAN AND THE BIOSPHERE SITES (WORLD BIOSPHERE RESERVES)

In 1979, as part of the International Biological Program, the

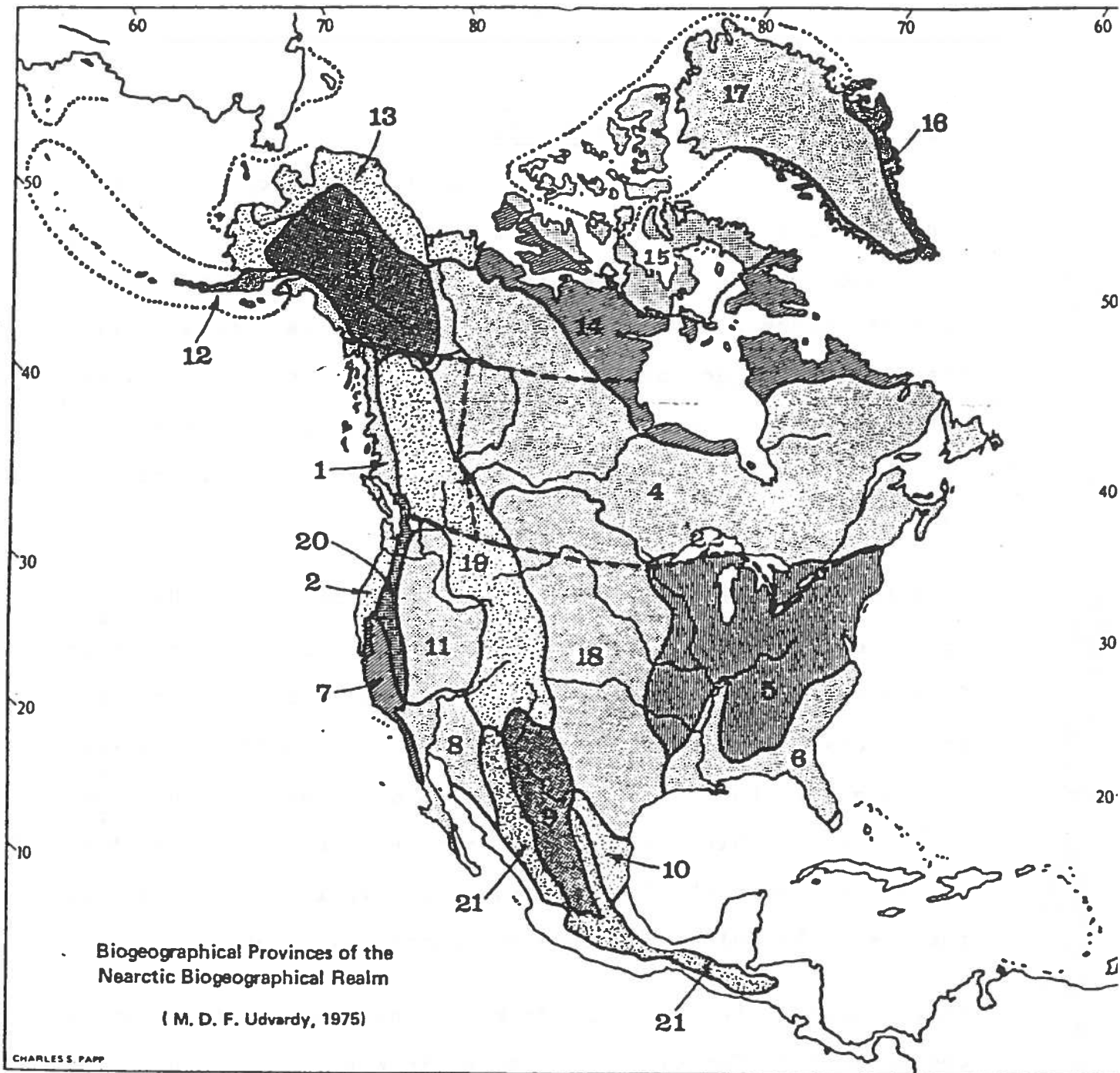


Figure 11. B.C. grizzly bear range has 5 or 6 of the 8 UNESCO world biogeographic provinces in Canada where grizzly bears occur. Although Waterton Lakes National Park in Alberta is a world biosphere reserve which includes grizzly bear concerns, none have been established in B.C. provincial parks.

- | | |
|-------------------|---------------------|
| 1. Sitkan | 11.? Great Basin |
| 3. Yukon Taiga | 19. Rocky Mountains |
| 4. Canadian Taiga | 20. Sierra-Cascade |

iv) WORLD CONSERVATION STRATEGY

In 1981, Canada endorsed the World Conservation Strategy. This is a 1980 international document prepared by the IUCN in co-operation with the United Nations Environment Programme (UNEP) and the World Wildlife Fund (IUCN 1980). In 1982, the Federal Government released Canada's Conservation Strategy complete with 22 recommendations including a "priority requirement" to establish "a comprehensive network of protected areas, securing the habitats of threatened, unique and other important species, unique ecosystems, and representative samples of ecological system types" (Environment Canada 1981).

To date this has not been done for grizzly bears. Many B.C. provincial parks would contribute significantly to a nationally recognized network of protected grizzly ecological systems or ecotypes.

v) Summary

THE B.C. PARKS SYSTEM CONTRIBUTES TO PRESERVATION OF THE INTERNATIONAL GRIZZLY POPULATIONS ALONG THE CANADIAN-U.S. BORDER. ALONG THE 49th PARALLEL, THE B.C. PARKS SYSTEM IS OF PERIPHERAL VALUE TO TWO ECOLOGICAL SYSTEMS AND OF ESSENTIAL VALUE TO THE NORTH CASCADES ECOLOGICAL SYSTEM WHERE THE GRIZZLY IS CONSIDERED A THREATENED SPECIES IN THE U.S. CATHEDRAL AND MANNING PROVINCIAL PARKS AND THE SKAGIT RECREATION AREA ARE OF SPECIAL INTERNATIONAL IMPORTANCE IN

G. COMPARISON OF B.C. PARKS' GRIZZLY BEAR MANAGEMENT APPROACHES TO OTHER PARK/WILDERNESS AGENCIES IN NORTH AMERICA

A review was made of relevant grizzly bear management documents from the following agencies:

- B.C. Parks Division
- B.C. Wildlife Branch
- Alaska Division of Parks (& Dept. of Fish and Game)
- Yukon Lands, Parks and Resources
- Northwest Territories Renewable Resources
- Alberta Provincial Parks (& Kananaskis Park)
- Parks Canada (& Kootenay and Kluane Parks)
- U.S. National Parks Service
 - Glacier National Park
 - Yellowstone National Park
 - Denali National Park
- U.S. Interagency Grizzly Bear Committee
- U.S. Dept. of Agriculture, Forest Service

As well, some key staff members were interviewed at Glacier Park, Montana, Kananaskis Provincial Park, Alberta and Kootenay National Park, B.C.

Following are the five different aspects reviewed:

1. OVERALL GRIZZLY BEAR PROGRAM

a) Other Agencies

Our search for a model bear-people management PROGRAM led into a confusing maze of programs, policies, directives, procedures, guidelines and plans. Different agencies often used different organizational formats.

The park management agencies for state parks in Alaska and territorial parks in the Yukon and Northwest Territories apparently have no formalized bear-people management program.

people conflicts. Lack of a formal program could also weaken B.C. Parks' legal position should lawsuits arise from bear attacks.

c) Recommendation

THAT B.C. PARKS IMPLEMENT A STATE-OF-THE-ART PROGRAM FOR GRIZZLY BEAR-PEOPLE MANAGEMENT.

2. POLICIES

a) Other Agencies

A review of the 8 park/wilderness jurisdictions outside of B.C. revealed that 4 have upper-level bear policies.

The U.S. Park Service grizzly bear policy (IGBC.(a). 1986) is based on the management policies of national parks, which are designed to:

- "1. restore and maintain the natural integrity, distribution and behavior of bears in the parks.
2. provide for visitors to understand, observe and appreciate bears.
3. provide for visitor safety by minimizing bear/human conflict by reducing human-generated food sources and by regulating visitor distribution."

Of the bear policies reviewed, this would appear to be the most applicable to the B.C. Parks situation because it covers 3 desired objectives: preservation, visitor appreciation, and visitor safety.

Alberta Provincial Parks is the only Canadian agency with an overall policy for bear conflict prevention. It also has a related policy of managing problem or nuisance wildlife in provincial parks/recreation areas. Alberta's bear policy (1985) is short and to the point:

"Operations and Maintenance Division will endeavour to minimize the potential for conflict between recreationists and populations of black and grizzly bears within or around Alberta provincial parks and recreation areas."

According to Jim Murphy, the Chief Ranger of Kananaskis Provincial Park, a major short-coming of this policy is its failure to allow for preservation of grizzly bears and their habitats.

Parks Canada does not have a bear management policy. Rather it has a national bear management directive (Draft, July, 1986) which guides planning and management for bears and visitors in national parks.

b) B. C. Parks

Although the B.C. Parks Division has the primary responsibility for management of grizzly bears in provincial parks, it does this co-operatively with the B.C. Wildlife Branch. While the Wildlife Branch has a policy for management of grizzly bears in British Columbia (B.C. Wildlife Branch 1979), the Parks Division does not have one for provincial parks. Instead it has 6 applicable policy documents:

- A System Policy For Provincial Parks and Ecological Reserves of British Columbia (December, 1985)
- Park Land Designation Policy (1985)

However, the background document on fish and wildlife management in provincial parks also makes it clear that:

"Parks are not generally intended to be nature preserves for wildlife, where ecological processes continue with no activity or use by man."

It is also relevant that the Wildlife Policy (1.4) states that boundary revisions and studies for new parks will consider the natural boundaries of significant wildlife populations. This is very important in the preservation of representative grizzly bear populations and their habitats.

How well do existing policies provide for public enjoyment of the grizzly bear, such as public viewing? This is covered in the Wildlife Policy (D2.2) which states that the park system will provide a variety of wildlife-related recreational opportunities including "sanctuaries where the public can view, photograph, and enjoy wildlife". This policy also provides the mandate for educational and interpretive programs related to grizzlies, as well as recreational hunting.

Since B.C. Parks has a dual mandate to provide for preservation of natural resources as well as for public enjoyment, we must ask whether the existing policies guarantee that park developments and visitor use will not erode B.C. Park's mandate to preserve grizzly bears? The System Policy (5.6) states that:

"Recreational use is managed to optimize public enjoyment while protecting natural values."

facility developments on grizzlies could be confined to the site. However, facilities wrongly located in prime grizzly habitats have the potential to seriously impact bears over a large area. On pages 75 to 77 we document how this occurred with the Fishing Bridge Development in Yellowstone National Park.

Another example of vagueness is the Master Plan Policy (1986) which states that master plans will provide for thorough information on all aspects of a park. However, the policy fails to specify the level of detail required such as adequate information on grizzly bear habitats for the planning of proposed visitor facilities. As well, this policy makes no reference for the requirement of impact studies prior to any recreational development, yet the wildlife policy does.

The lack of clear policies related specifically to grizzly bear preservation and management, along with the lack of bear directives and guidelines, have contributed to the present disorganized approach by B.C. Parks to bear-people management. Without adequate objectives set forth in policies, the Division will be unable to effectively meet the complex challenge of managing people and bears in its large system.

The reliable monitoring of trends in grizzly bear populations is also very important. The population of threatened grizzly bears in the Yellowstone Ecological System is monitored for total annual known mortality and the number of reproductive females with young. By monitoring these and other variables, population status is inferred (Knight and Eberhardt 1986).

b) B.C Parks

B.C. Parks only monitors bear complaints. One standardized form is used to meet the requirements of the Wildlife Branch in handling problem bears. The "Park Officer Daily Report" provides only 3 categories:

Bears - Complaint - No action
 - Killed
 - Trapped and Released

These daily reports are tabulated in the Zone and District Monthly Occurrence Summaries. Ultimately, the Senior Safety Officer in Victoria tabulates the district summaries for all of the provincial parks. It should also be noted that, since 1983, bear attacks are also to be reported to the Senior Safety Officer in Victoria (Foster, pers. comm.).

Our evaluation showed that no formal attempt is made by B.C. Parks to review or interpret the provincial bear complaint data. For example, the summary report of "Public Safety and Park Security 1985" does not refer to bears, even though they pose a minor but serious concern to public safety. Our review

some provincial parks and that the Wildlife Branch is concerned about the over-kill of grizzlies by hunters in some parts of B.C. (Tompa 1984).

When compared to the sophisticated bear monitoring systems of some outside agencies, the B.C. Parks Division's system of ^{MONITORING} is very deficient. Essential information is usually not recorded. This includes grizzly bear sightings, bear-people encounters, garbage incidents, total annual mortality, population trends and other information. Without a comprehensive monitoring system, grizzly bears and people cannot be properly managed in provincial parks.

c) Recommendation

THAT B.C. PARKS UP-GRADE THEIR GRIZZLY BEAR MONITORING SYSTEM AS A PRINCIPLE COMPONENT OF A COMPREHENSIVE BEAR MANAGEMENT PROGRAM. SUCH MONITORING SHOULD INCLUDE THE TOTAL ANNUAL KNOWN MORTALITY AND POPULATION TRENDS IN AND AROUND PROVINCIAL PARKS.

4. PUBLIC COMMUNICATION

According to Taylor (1984):

"The general lack of public knowledge concerning bear behavior, habitat requirements and relationships with man is recognized as the 'root cause' of the vast majority of bear/human conflicts."

Thus a good public information/education program is a key element to the success of any grizzly bear management program.

Perhaps even more instructive is a computerized "interactive" video program being prepared for visitor education in Denali National Park, Alaska. Visitors will be given a choice of responses to different situations on a screen such as a grizzly foraging on a sidehill or a grizzly behaving aggressively. After the person makes his choice, the computer will relay the appropriate response (Dalle-Molle, pers. comm.).

One of the most effective public education efforts has been the Parks Canada film "Bears and Man" which has been viewed by millions. Another is the state-of-the-art book "Bear Attacks, Their Causes and Avoidance". (Herrero 1985) which is now used widely for public education. The sale of this book is a major element in Yellowstone Park's public education thrust.

In Katmai National Park, Alaska, a bear pamphlet in German communicates the bear message to visitors from that country (Anon.c. 1986).

Some public information programs aim at co-ordinated ecological system management in and around parks. For example, the "Information and Education Plan for the Grizzly in the Yellowstone Ecosystem" emphasizes the more positive aspects of bears such as their value in this ecological system and what must be done for their survival (Taylor op. cit). The U.S. Forest Service's brochure "A Last Stand For Grizzly Bears" (1984) outlines the agency's role in the recovery of the grizzly in the 6 U.S. ecological systems.

-the "British Columbia Road Map and Parks Guide to Supernatural British Columbia" (1986, Tourism B.C.) provides an index to all B.C. provincial and national parks and their amenities but does not mention that grizzly bears occur in numerous parks, are potentially dangerous, and that a bear pamphlet is available.

-the regional park and road map brochures (B.C. Parks) have similar deficiencies. For example, "Provincial Parks of Northern B.C." mentions grizzly bears but not their potential danger. As well, it neglects to draw attention to the bear hazards known in Bowron Lake and Tweedsmuir(South) Parks. This same type of brochure for the Kootenays doesn't even mention that grizzly bears occur in most of the parks, let alone that one of the more accessible parks, Kokanee Glacier, has a fairly high grizzly bear hazard. Thus B.C. Parks is missing excellent opportunities to inform visitors on the occurrence and potential hazards of grizzly bears before visitors arrive at B.C. provincial park areas.

-the information pamphlet for Kokanee Glacier Park (1985) also fails to inform the public that two of the trails featured have high grizzly hazards. One of these has a seasonal closure. Worse still, a campsite that was closed because of grizzly hazards is still designated on the brochure map.

-other opportunities to inform the public about grizzly bears are not being used. For example, the Kokanee Creek and Mt. Robson Visitor Centres could feature grizzly bear ecology/public safety exhibits but no such programs are provided other than periodic bear slide talks. Safe public viewing of grizzlies offers important opportunities for public education yet no sites or programs have been established in provincial parks.

On the positive side, some excellent progress has been made in certain parks:

-brochures for Tweedsmuir South (Figure 21) and Bowron Lake Parks provide good information on some local bear ecology and the need for special precautions. The Valhalla Park brochure indicates the grizzly hazard identified for one trail.

-two campgrounds, Atnarko and Meziadin, have large warning signs that describe local grizzly ecology.

-Bowron Lake Park Centre includes bears in its public information program on the park and visitor safety (food cache display, pamphlets and slide talk). This is an example of a public information program linked to specific actions by park staff members to minimize conflicts between bears and people.

5. PLANNING

Planning provides a systematic, organized approach to grizzly bear-people management. A lack of planning could mean letting a situation develop until a bear mauling occurs and then being unprepared to deal with its ramifications.

a) Other Agencies

Ten years ago, a review of black bear management in the U.S. National Park system concluded that planning was fundamental to a successful bear management program (Martinka 1976). Extensive planning is now done for management and recovery of the threatened grizzly bear in the lower 48 states. Examples include the U.S. Interagency Public Information/Education Action Plan (IGBC, b.1986) and bear management plans for individual national parks.

Planning for grizzly bears in Canadian National Parks did not appear until the mid 1970's, perhaps as a result of a series of fatal maulings in some of the western national parks (Taylor, 1984). Today nearly all national parks in grizzly country have a bear management plan. In an intensive review, Taylor showed that many of these plans were deficient. He formulated 14 essential elements which were recently used by Kootenay National Park to design a state-of-the-art bear management plan.

gradually expanded to almost a "village" that now includes a museum, amphitheatre, store, trailer park, gas station and repair shop, employee housing and two large campgrounds (a 353-site concessioner-operated R.V. park and a 308-site National Park Service campground). By 1981-83, an average of 291,028 visitors ("person days") used the core area and road corridors in July and August and thousands used the surrounding areas.

The Fishing Bridge Grizzly study revealed that grizzly habitats at the development and adjacent areas were so diverse and ecologically rich as to be "among the finest in Yellowstone Park". The variety of nutritious bear foods includes bison and other ungulates, small mammals, spawning cutthroat trout, pine nuts, grasses, sedges and others. As many as 39 grizzlies have been counted in the general area. Fishing Bridge is also on a bear cross-roads. While some displacement of grizzlies occurred, many grizzlies continue to use the area because of their reliance on the abundance of seasonally important bear foods.

The research showed that the negative impacts of Fishing Bridge on the threatened population of grizzlies in Yellowstone was greatly out of proportion to the impacts induced by other park developments. From 1968-1983, Fishing Bridge accounted for 16 grizzly-caused injuries to people in the developed area and within a radius of one mile. This was over half of the 27 grizzly caused injuries to people in

hikers or campers to make them abandon their packs. At least one mother grizzly and two offspring were killed in control actions.

Habitat studies and grizzly bear counts done between 1980-83 showed that existing trails passed through important bear habitats, in particular feeding areas for soapberries and hedsarum roots. An abundant population of grizzlies, estimated to average 22 bears, is known to seasonally forage in the area (Ott 1984).

Given the problems encountered in the Slims River/Sheep Mtn. area, Parks Canada has since decided to gather detailed habitat information before proceeding with major trail development. However, the problem is now compounded because some bears have learned to direct aggression towards humans in order to obtain food. These problems should have been anticipated and possibly avoided if habitat and population evaluation studies were used to plan human use prior to establishment of visitor patterns.

b) B.C. Parks

B.C. Parks has no overall planning directives or guidelines related to grizzly bears but some planning has occurred on an ad hoc basis. Following is a review of the various levels of B.C. Parks' planning:

Similarly it was noted that the boundary review of 8 existing parks (System Policy 1985) was deficient in complying with Wildlife Policy as it would relate to grizzly bears. Two examples will suffice. For Tweedsmuir Park the review concluded that:

"the forested plateau lands in the central portion of the park do not have significant park features and are not integral to the high wilderness areas of the park." (See Figure 12)

However, potential grizzly bear habitats were not evaluated even though it is very likely that they would be significant. Also ignored was the high international value of maintaining Tweedsmuir as B.C.'s largest park and as an intact ecological system for grizzly bears. Integral to this would be preserving the forested plateau in the centre of the park (Figure 12).

For Kokanee Glacier Park, this system review also proposed the exchange of boundary areas of low park value for areas of high park value. These values appear to have been based on recreational significance rather than including conservation values as stipulated in policy. For example, the "low park value" area of Coffee Creek is the only major forested huckleberry zone identified in Kokanee Park that receives high grizzly use (McCrorry 1985) and is thus of high conservation value (see Figure 13).

As well, the value of keeping this important grizzly habitat within the park should have been considered from the perspective of the high potential for human-grizzly conflicts

It also allows for guidelines for further action, such as action plans as part of resource management. Policy also states that wildlife should be one of the background parameters in setting overall park goals and priority actions. How well do existing master plans incorporate grizzly bear concerns in determining park goals, facility developments, zoning and future resource management actions? To answer this, we reviewed 5 recent master plans that represent a wide spectrum of parks, grizzly bear habitats and developments. These plans propose considerable enhancement for visitor use in parks which also have important grizzly bear populations. For example, some provide for private concessions such as fly-in fishing camps or lodges. The major tourism marketing of these parks is also planned. These tourism-recreation goals represent a major new direction for these parks.

Preparation of the 1986 draft plan for Valhalla Park commenced shortly after this 49,600 hectare park was set aside in 1983 in the Columbia Mountains of southern B.C. This was the first provincial park in which grizzly bear habitat and hazard information was incorporated into a master plan prior to development of recreational facilities. Bear information was used to:

- help set park goals.
- identify the importance of the park's wildlife values.
- zone areas for people use and wilderness so that important grizzly bear areas have limited human visitation.
- plan trails, campgrounds and mountain huts to avoid most of the important grizzly habitats.
- recommend that action be taken on operational procedures to minimize potential bear-human conflicts.

(UNESCO) of adjoining Jasper National Park. The Mt. Robson Plan outlines an expanded system of developments including hiker and horse trails, heli-hiking and campgrounds. Associated with this is a promotional strategy to market the park. Although the plan mentions that known critical wildlife habitat be avoided by heli-hiking and that potential threats to wildlife be assessed, it makes no recommendation for careful planning of all facilities and visitor activities (Figure 14) to minimize potential bear-human conflicts prior to development. The plan also recommends removal of the Swiftcurrent Creek Valley from the park as having the most benefit to the Division's conservation objective without any assessment of critical grizzly habitats that could be lost.

On the positive side, staff did point out that an area on the south side of the Fraser River was zoned as wilderness because of grizzly bears. Also, all hunting was recently closed in Mt. Robson Park. However, this master plan is still seriously deficient because it fails to incorporate important grizzly bear values into the park's goals and because it fails to identify the need for strategies to minimize grizzly bear-people conflicts. This is a very serious oversight when one considers that Mt. Robson has already had one black bear mauling (Herrero 1985) and one grizzly bear mauling (Rogers, pers. comm.). As well, visitor use and facilities, if allowed in prime grizzly habitats, could impact the grizzly bear population that ranges in an adjoining World Heritage area.

The 1986 master plan for B.C.'s third largest park, 527,307 hectare Wells Gray in the Columbia Mountains, is also deficient in incorporation of concerns for bears (Figures 15 & 16). The plan recommends a large increase in visitor facilities including a paved road, concessionaire camps, trails and campgrounds - along with a major tourism marketing strategy. However, no specific recommendations are made for careful planning of developments to avoid prime grizzly habitats. Some facilities such as a privately-operated fly-in fishing camp have already been approved. Prior to the master plan, a campground was built in a prime berry patch which has led to numerous black bear problems (Whitfield, pers. comm.).

On the other hand the plan recognizes grizzly bear habitats as one of the park's natural features of provincial significance and because of this, one area was zoned as a nature conservancy.

However, the lack of careful consideration of grizzly bears in the planning of the many facilities as proposed in the Mt. Robson and Wells Gray master plans shows that the Division does not always follow Master Plan Policy and Wildlife Policy on impact assessment. This could potentially lead to the Division inadvertently creating grizzly-people conflict situations detrimental to park visitors, tourism strategies and grizzly populations.

WELLS GRAY PARK

PARK ZONES

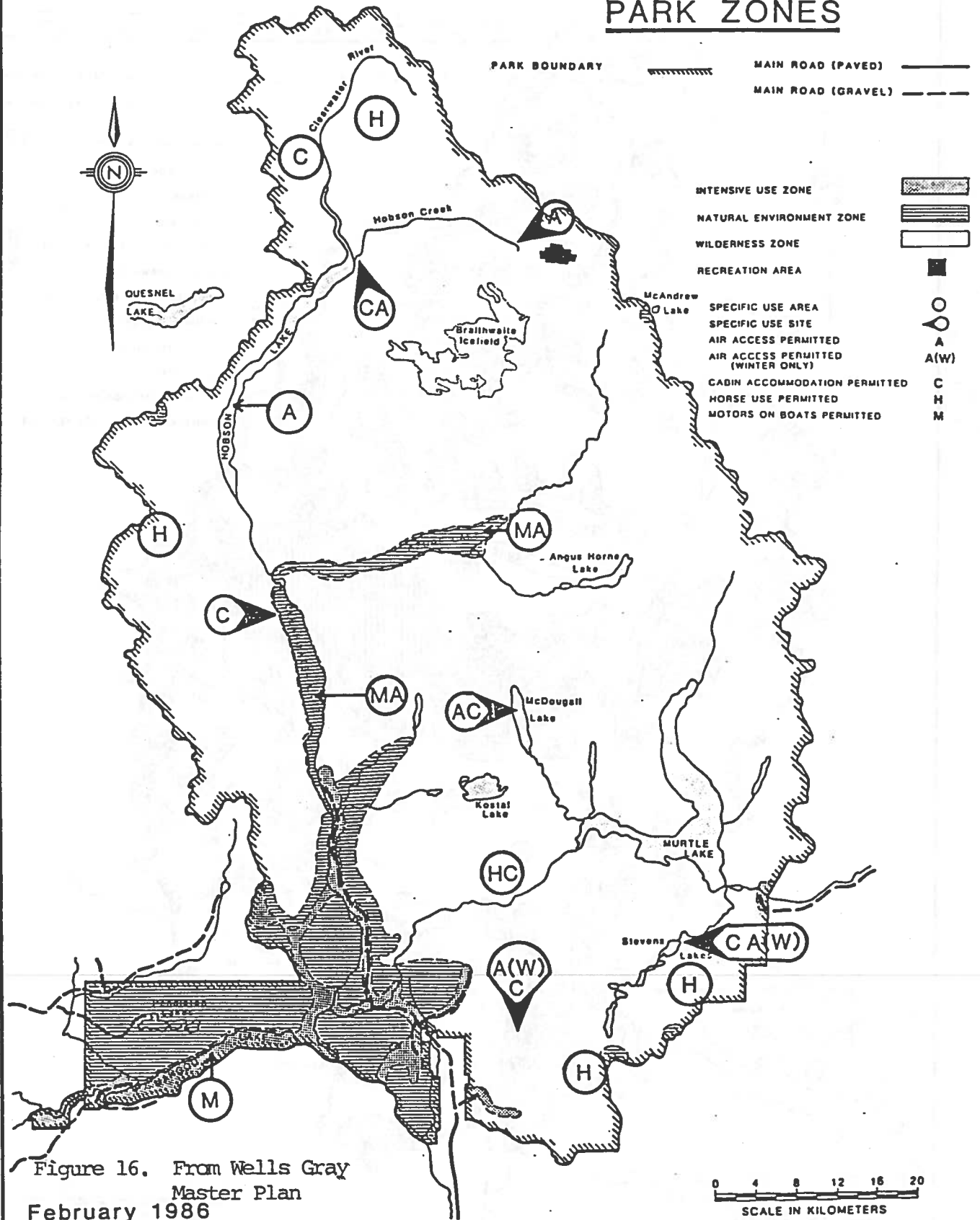


Figure 16. From Wells Gray Master Plan February 1986

Recommendation

THAT ALL MASTER PLANS FOR ALL PARKS WITH GRIZZLY BEARS INDICATE A COMMITMENT TO INCORPORATE AN ADEQUATE LEVEL OF INFORMATION ON GRIZZLY BEAR HABITATS, POPULATIONS AND PRESERVATION VALUES. SUCH INFORMATION SHOULD BE COLLECTED AND USED IN SETTING PARK GOALS, ZONING AND PLANNING OF PARK DEVELOPMENTS TO MINIMIZE GRIZZLY-HUMAN CONFLICTS AND IMPACTS ON GRIZZLY BEARS. THE MASTER PLAN SHOULD REQUIRE THAT THIS BE DONE PRIOR TO ANY FACILITY DEVELOPMENT.

[Black bear information should also be considered because of the propensity of the species to cause problems if facilities are situated in their foraging and travelling areas.]

iv). Grizzly Bear-People Management Plan

This is the plan that outlines actions at the field level such as what procedures to use in the event of a bear mauling. Such plans have not been necessary for many B.C. provincial parks because of their limited visitor use. Thus far, only one bear management plan has been prepared. This is the West Kootenay District Bear Management Policy (1985) - which is actually a plan. Modelled after the Glacier National Park (B.C.) bear management plan, it provides an excellent preliminary framework for staff to attempt to reduce the potential for conflicts between park visitors and grizzlies in Kokanee Glacier Park.

Meziadin Lake is one of the more attractive recreational spots along the Stewart-Cassiar Highway, north of Smithers. It is also strategically located at a major road junction. The area is known for its high quality grizzly habitats. Grizzlies occur throughout the season, but concentrate in August to feed on spawning sockeye salmon near the mouth of Hanna Creek where it flows into Meziadin Lake. Summer cottages (crown leases) have been built near the mouth of Hanna Creek. Other developments in the Meziadin road junction area include a small trailer-motel complex, a Ministry of Highways complex and a B.C. Telephone substation.

Increasing numbers of visitors randomly camped at Meziadin Lake, including vacant lots on the lakeshore. This meant no control of garbage and foodstuffs, with the obvious potential for creating serious bear conflicts.

The Parks Division decided to build a campground to meet the growing public demands and to attempt to control the potential bear-garbage problems. Since recreation use was traditionally established at Meziadin Lake and no other attractive campground sites existed within reasonable distance, Meziadin Lake appeared to be the only practical location. However, because of the risks associated with locating a campground in such a prime grizzly area, regional and district staff, with input from the Wildlife Branch, put considerable effort into a campground design and management plan. The 40-unit campground was opened at the lakeside in the spring of 1986.

problems should be carefully monitored.

The Meziadin example demonstrates that some mitigative measures can be tried where traditional people use of an area creates a need for a visitor facility in a potentially hazardous grizzly area. Ideally, however, campgrounds, even in smaller parks, should not be built in prime bear habitats.

Recommendation

THAT PLANNING OF SMALL PARKS AND ASSOCIATED VISITOR FACILITIES CONSIDER GRIZZLY BEAR HABITATS AND THE ASSOCIATED POTENTIAL FOR GRIZZLY-PEOPLE CONFLICTS.

vi). Recreation Area Planning

Recreation areas do not provide the same protective status for grizzly bears as Class A parks. Existing policies allow for some industrial activities under park use permit such as mineral exploration, mining development and logging. If not properly planned and regulated such activities could cause negative impacts on grizzly bear habitats and populations. For example, a minesite could destroy a critical habitat such as a root feeding area that might be used by grizzlies from a large area. Lack of planning for garbage disposal and food storage at crew camps could cause serious conflicts with bears. The bear-human conflict management action plan for Denali National Park and Preserve, Alaska (Anon.c. 1984) provides for ranger patrols of mining claims in the park.

CHAPTER II. THE PROPOSED SITUATION

A GRIZZLY BEAR-PEOPLE MANAGEMENT PROGRAM FOR B.C. PROVINCIAL PARKS

The following program was designed by integrating information on the variety of bear management approaches used by other agencies in North America with the suggestions made by numerous B.C. Parks' personnel, our background review of existing B.C. Parks' grizzly bear management, and the most up-to-date biological information on grizzly bears. This new program was also tailored to be readily applied to the existing B.C. Parks system.

The essential components of the overall program include 3 bear policies, 17 overall management directives and relevant operational guidelines, plus grizzly bear-people management plans.

The program is intended to provide a state-of-the-art framework for sound grizzly bear-people management while allowing some flexibility in application because of the diversity of situations presented by such a large park system.

We are suggesting that a bear specialist be hired as a coordinator for the 3 year implementation phase.

9. Public Communication
10. Public Viewing of Grizzly Bears
11. Artificial Food and Garbage Management
12. Problem Bear Management
13. Emergency Planning - Bear Attacks
14. Visitor Management
15. Staff Training
16. Research
17. Law Enforcement

III. GRIZZLY BEAR-PEOPLE MANAGEMENT PLANS

These will be the action plans at the district level to ensure implementation of the directives. These should include operational plans for the larger, more visited parks with grizzly bears.

B. BACKGROUND FOR KEY ELEMENTS OF GRIZZLY BEAR-PEOPLE MANAGEMENT PROGRAM

The contents of the program will be:

I. RECOMMENDED POLICIES

1. Preservation Policy

The grizzly bear in the B.C. Parks system is recognized as the prime symbol of wilderness and as a heritage resource of high provincial, national and international significance. It is regarded as a wilderness indicator species, as a measure of the health and integrity of ecological systems. The grizzly has large home ranges and a low reproductive rate. The grizzly bear is thus more vulnerable to population declines or losses brought about by mortality and habitat destruction by man than any other large mammalian species in the provincial parks. Some of its behaviour creates a concern for public safety. Therefore the grizzly bear should be given the highest management priority of the wildlife species.

The B.C. Parks system contributes more to preservation of the grizzly than does any other land use designation in B.C. As part of its conservation mandate, the Division will maintain and restore, if necessary, the natural integrity, numbers and behaviour of grizzly bears while recognizing that grizzly

National Park (Anon. (a). 1986). Where necessary special guidelines are provided for some directives.

1. Program Objectives

This directive should summarize the 3 grizzly bear policies. It should also target the program's goals over a set period of time. Similar goals should be re-stated in the district/park bear-people management plans although some goals might be modified at that level. Where possible, goals should be formulated in measureable terms.

The program's goals should be set over a three year period (1987-1989). Action could be to set province-wide targets for reducing the number of grizzly-people encounters, control actions, total annual numbers of grizzlies killed by people or other aspects. B.C. Parks might decide on a goal to allow recovery of remnant grizzly bear populations to natural levels in some major parks (e.g. Garibaldi, Manning). Initially, goals will have to be set at a level in keeping with the preliminary nature of the program and then modified later when the program is well established.

2. Organizational structure

This should point out that the complex task of grizzly-people management definitely requires a co-operative team effort by everyone in the bureaucratic system, from a planner in Victoria to a garbage collector at a campground (Figure 17).

This directive should specify that the program be systematically organized throughout the Division.

Action should include an organizational chart for the Victoria and regional levels in order to assign responsibilities. At the district/park level, organization will be done through the grizzly bear-people management plans.

3. Program Evaluation

This directive should state that the program be evaluated annually to assess whether its short and long-term goals are being met. Action should involve periodic reviews of the overall program (and the district/park bear-people plans) by an impartial team of knowledgeable evaluators using formalized criteria derived from the program objectives.

How do you measure preservation of the grizzly bear? One way would be to evaluate the park additions and deletions on an annual basis in relation to overall grizzly populations, preservation values and habitats-ecological systems represented by provincial parks. Another would be to measure habitat losses, the trends in population levels and total known annual mortalities to grizzlies in the different park ecological systems. Data on known annual mortalities in and around parks would be fairly easy to obtain, but population trends will be more difficult to determine

Visitor appreciation of grizzlies could be evaluated by the total number of public information brochures distributed, the

5. Co-operative Management Between The Parks Division and Other Agencies Within Parks

B.C. Parks presently has legislative jurisdiction over all matters concerning grizzly bears in provincial parks but co-operates with the Wildlife Branch in setting bear hunting quotas and managing problem bears. Most Parks' personnel favour strengthening interagency co-operation.

The interagency directive should state B.C. Parks' official position regarding this matter.

Action should clearly outline the various responsibilities of both agencies for grizzly bear-people management in provincial parks.

6. Co-ordinated Ecological System Management

Grizzly bears in provincial parks forage widely within large home ranges which frequently extend beyond park boundaries. Therefore, they come under a variety of land jurisdictions, often with different and sometimes opposing management objectives. In the Yellowstone National Park ecological system the average grizzly uses 4.3 jurisdictions per year (Knight, pers. comm.). Some grizzlies in Mt. Assiniboine Provincial Park might frequent a total of 5 different jurisdictions. In some they would be totally protected, in others they would be hunted. Some grizzlies in parks along the Canadian-U.S. border would come under international jurisdiction. For example, some grizzlies surviving in the remnant population

co-ordinated ecological system management.

This directive should state the general intent of the Division to initiate co-ordinated management around provincial parks important to grizzly bears. It should specify the responsibilities of both the Parks Division and the Wildlife Branch as the lead agencies.

Operational guidelines will be required for this type of management. The U.S. Interagency Grizzly Bear Committee's guidelines (IGBC a. 1986) is a useful background source.

Action would involve defining the appropriate information to be gathered, structure of committees, priorities for action (such as elimination of dumps) and other aspects. Provincial parks should be prioritized according to their need for co-ordinated management. Also, criteria are needed to delineate the size and geographical boundaries of ecological systems around the larger parks. An ecological system boundary has already been proposed for Kokanee Glacier Park (McCrory 1985).

Staff could obtain first-hand experience by representing the Akamina-Kishenina Recreation Area on the committee for co-ordinated management of the Waterton Lakes National Park World Biosphere Reserve. Another opportunity would be to represent Mt. Assiniboine Park on the regional (co-ordinated) management committee being implemented for cross-boundary wildlife concerns by Kootenay National Park.

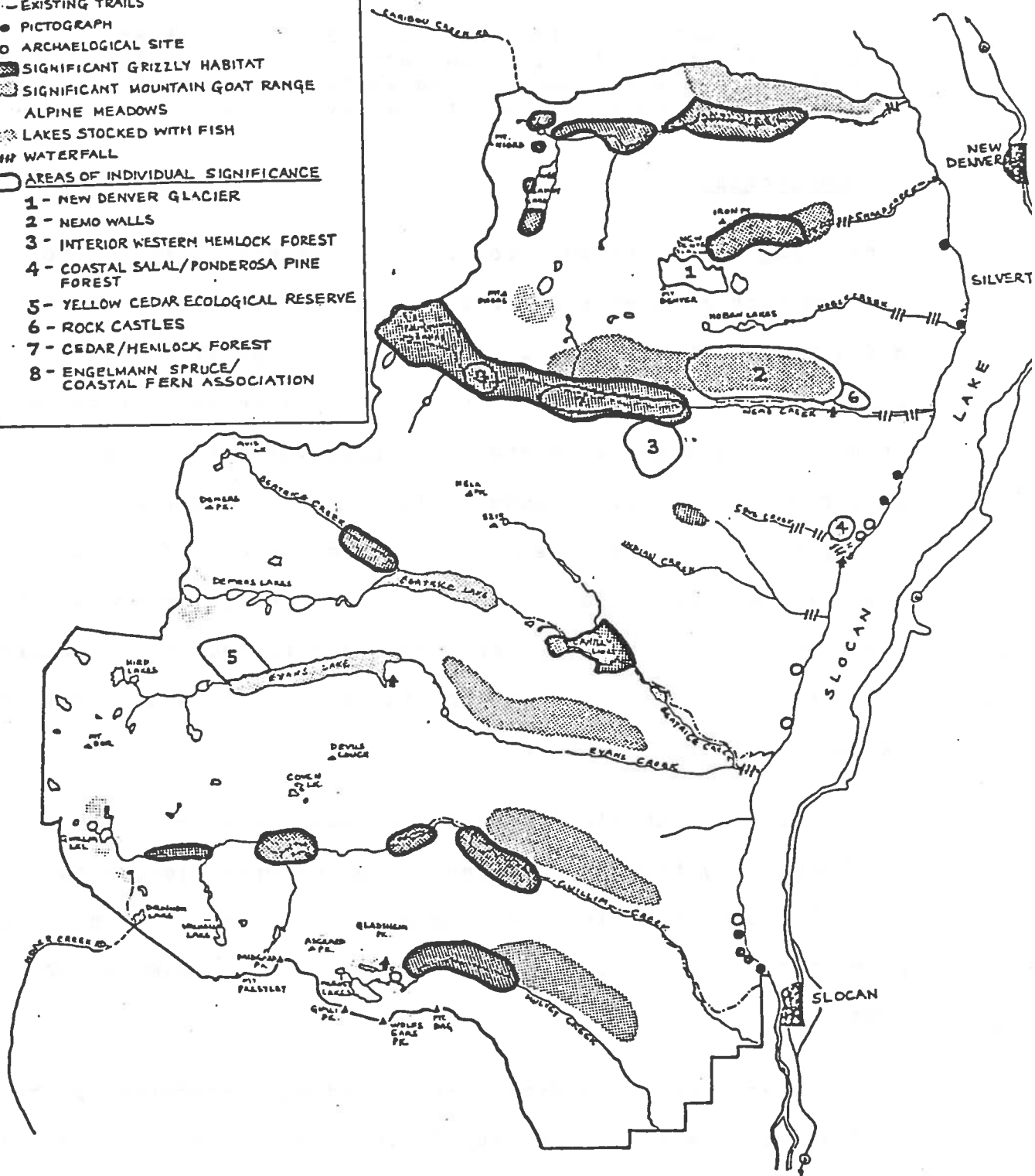
Alberta (Herrero et al. 1983) and Valhalla and Kokanee Glacier Parks (McCrorry et al. 1985) demonstrated the importance of locating recreational facilities away from key grizzly bear habitats.

Two case studies (pp.75-77) demonstrate the serious consequences of not planning. The first case study examined the historical location of Fishing Bridge Development in some of the finest grizzly habitat in Yellowstone National Park. This developed area accounted for over half of the 27 grizzly injuries to humans and nearly half of the 61 grizzly removals over about a 15 year period. The impacts on the grizzly population covered an area about the size of this large park. The second case study was Slims River Valley in Kluane National Park, Yukon. We suggest that careful planning of trail and campsite locations could have prevented a growing conflict between grizzlies and people, including grizzlies charging hikers to obtain food.

This directive should state that adequate information on grizzly bear populations, habitats and preservation values be incorporated at every level of park planning, where applicable. This would include system plans, master plans, resource management plans, smaller park plans, recreational facility site plans and the planning of industrial activities in recreation areas. [Also see grizzly-bear-people management plans, pp.132-134].

LEGEND

- ▲ EXISTING CABINS
- - - EXISTING TRAILS
- PICTOGRAPH
- ARCHAEOLOGICAL SITE
- ▨ SIGNIFICANT GRIZZLY HABITAT
- ▩ SIGNIFICANT MOUNTAIN GOAT RANGE
- ▧ ALPINE MEADOWS
- ▦ LAKES STOCKED WITH FISH
- ⦶ WATERFALL
- AREAS OF INDIVIDUAL SIGNIFICANCE
- 1 - NEW DENVER GLACIER
- 2 - NEMO WALLS
- 3 - INTERIOR WESTERN HEMLOCK FOREST
- 4 - COASTAL SALAL/PONDEROSA PINE FOREST
- 5 - YELLOW CEDAR ECOLOGICAL RESERVE
- 6 - ROCK CASTLES
- 7 - CEDAR/HENLOCK FOREST
- 8 - ENGELMANN SPRUCE/COASTAL FERN ASSOCIATION



VALHALLA PROVINCIAL PARK

NATURAL FEATURES



Figure 18. Areas of important grizzly bear habitats used in the Valhalla master plan to plan and zone new park to minimize grizzly -people conflicts. Developments were avoided in two valleys with important grizzly habitats,

Parks Canada **Parcs Canada**

Computer Record # _____

MOUNTAIN PARKS WILDLIFE CARD

HOUR DAY MONTH YEAR OFFICER PARK OBS

WATERSHED ASP ELEV TOPO

UTM COORDS MAG SNOW SPECIES

TOTAL SEX ADULT JUV

MARKED: Yes No

BEHAVIOUR: Food Rest Hunt Drink Insect

SNOW CRUST: None Light Medium Hard

CAPTURE: Trap Snare Dart Other

ACTION: None Destroy Remove Other

BIOM: None One Few Med Abund Int

FOOD TYPE: Bark Furb Grass Hb [red]

MORTALITY: D HWY Food Dis Other

NOTES

LOCATION:

NOTES 1

NOTES 2

NOTES 3

NOTES 4

NOTES 5

SCORITE TATTOO

TAB LEFT TAB RIGHT

OBSERVER NAME

Bear Monitoring

OBSERVATION TYPE	BEAR LOCATION	BEAR SIZE
A sighting	A campground HVU	1 2 3 4 large (A)
B track	B campground BC	1 2 3 4 med (B)
C scat	C picnic site	1 2 3 4 small (C)
D diggings	D roadside	1 2 3 4 unk (D)
E foragings	E open/clear	
F rub tree	F trail HVU	
G dry bed	G trail BC	BEAR COLOUR
H den site	H off trail	1 2 3 4 black (A)
	I BC hut	1 2 3 4 blonde (B)
	J stream side	1 2 3 4 silver tip (C)
OBSERVER DIST		1 2 3 4 mottled (D)
A far		1 2 3 4 brown (E)
B medium		1 2 3 4 tan (F)
C close		1 2 3 4 gray (G)
D contact		1 2 3 4 dk brn (H)
E unk		1 2 3 4 other (I)

PRINT CLEARLY
USE PENCIL

BEAR REACTION	PROPERTY DAMAGE	FOOD ASSOCIATION
A no change	A tent	A none present
B fled	B pack	B odors only
C indifferent	C food sack	C present unguarded
D curious	D ice chest	D abandoned as bear approached
E food seeking	E building	E unburned garbage
F illegally fed	F food cache	F hung properly
G threat	G motor vehicle	G in vehicle trunk
H charge, no contact	H recr. vehicle	H in vehicle side trunk
I charge, contact	I trailer	I pass. section vehicle side trunk
	J tent trailer	J unknown
	K other	K improperly hung

NOTES ON BEAR/HUMAN INTERACTION

PARK ACTION	
A none	D post hazard
B investigate, patrol	E limited access
C set trap/snare	F close area

MANAGEMENT NOTES

Figure 19. Example of level of detail of bear information obtained by Kootenay National Park.

This directive should state that B.C. Parks will adequately inform a wide segment of the public about grizzly bears and their preservation to enhance public appreciation and visitor safety. The Parks' information program should be co-ordinated with other agencies which have a role in public relations such as the Wildlife Branch and Ministry of Tourism.

From a liability standpoint, perhaps a goal should be that each and every legal park visitor receive at least one brochure about grizzly bears. As recommended by B.C. Parks' personnel, there should be a wide scale media campaign including T.V. ads, videos, a B.C. bear film and displays at Visitor Centres. (See Appendix C, pp. 155 - 156).

The public information program should be applicable not only to provincial parks but to ecological system management of grizzly bears around parks. This would help gain better co-operation from ranchers, loggers, tree-planters and other land-users around parks. Some of the 30 categories of bear information from Kootenay National Park could be used (Table 8). An overall information distribution plan should be prepared to reach the public prior to and during their park visits.

10. Public Viewing of Grizzly Bears

Public viewing of grizzly bears can provide unique opportunities for visitor appreciation of grizzlies in the wild. Public viewing also has the potential for improving

A warning

Persons contemplating a visit to Tweedsmuir Provincial Park are reminded that it is a wilderness with virtually no supplies of any kind. Accommodation in the park and nearby communities is limited. Suitable clothing should be worn and proper equipment for outdoor living carried. Visitors should be in possession of appropriate maps. Persons wishing to register should do so with the nearest detachment of the Royal Canadian Mounted Police.

A NOTE OF CAUTION: Grizzly bears concentrate along the Atnarko and Dean Rivers in the fall for their own brand of fishing. Make plenty of noise along the trails and watch both river banks when fishing since the animals are unable to hear your approach near water, and cannot see well. Do not attract bears with the scent of fish on your clothing or around your camp. Be prudent; burn all food and litter scraps and store provisions securely.



Breakfast for bruin from the Dean River

Figure 21. An example of a specific bear warning message used in the Tweedsmuir Park South pamphlet. B.C. Parks should issue more bear information in other pamphlets.

the grizzly bear's public image which has been somewhat distorted by the media hype that surrounds the rare grizzly attacks on humans.

In Alaska, at least 4 protected areas, including two national parks, provide opportunities for the public to observe, photograph and study grizzly bears. Bear viewing in several of these Alaskan areas is recognized as a world-class resource. In B.C. provincial parks such potential has hardly been explored.

The directive should indicate the Division's intent to evaluate the potential for public bear viewing opportunities in provincial parks. This program should be co-ordinated with the Wildlife Branch whose second goal for grizzly bear management is to provide for non-consumptive use.

In general, careful planning would be required to ensure public safety. At some sites action might involve the erection of viewing platforms. Intensive visitor management would probably be required. At other sites, natural buffering such as viewing from across lakes, might minimize supervision.

11. Artificial Food and Garbage Management

The acute sense of smell and large omnivorous appetites of bears predisposes them to be attracted to human food and garbage more than any other park mammalian species. Careless garbage handling and management and improperly stored human food provide the two largest sources of artificial foods for

A Carrion Management Strategy
Kootenay National Park 1985-89

This strategy will apply for the period May 1 through October 31, 1985-89.

Frontcountry

- Large mammal carcasses found in or adjacent to frontcountry areas will be removed as soon as possible by the Warden Service and deposited in 1 of 4 approved carrion deposit sites.
- The approved sites for 1985 are: (1) Mile 1.0 Hector Gorge fire road, (2) Mile 6.0 Cross River fire road, (3) the old '4 Mile Dump' site and (4) the Revelstoke Sawmill beehive incinerator.
- Sites 1-3 will be legally closed by posting area closure signs at the access points to each site. Only persons authorized by the Superintendent may enter these areas.
- Use of site 1-3 will be on a rotational basis. If all 3 sites are full (ie: scavengers have not 'cleaned up' the carcass), then use of site 4 will be considered. Site 3 may be phased out over the next 2 seasons due to its use as a 'borrow pit.'
- If site 4 is used, a Park Warden will remain at the site until the carcass has entered the beehive.
- Use of all carrion sites will be recorded on an Occurrence Report.
- Wardens will periodically monitor recently used sites to ascertain the rate of removal and the scavenger species. Observations will be reported by way of the Wildlife Observation Card.
- Experiments to test the feasibility of using explosives to remove carrion from backcountry areas may be undertaken from time to time.

Backcountry

- Large mammal carrion found in backcountry areas that are likely to be frequented by visitors will be removed if possible. Helicopter or packhorse removal methods will be considered. If the carrion cannot be removed, the surrounding area will be legally closed until the carrion has been 'cleaned up' by scavengers.
- Costs involved in the removal of domestic stock carrion will be done by the owner of the stock.
- The Occurrence Report will be used to report all backcountry carrion actions.

Table 9. An example of one strategy used by Kootenay National Park to minimize potential bear-people conflicts. This would be very applicable to B.C. Parks' grizzly bear-people management plans.

**Time/Action Schedule for Food Storage Facility
Installations
Kootenay National Park 1985-89**

<u>Location</u>	<u>Installation Date</u>	<u>Type of Facility</u>
Floe Lake	July 1985	Bear pole
Tumbling Creek	July 1985	Bear pole
Helmet Falls	July 1985	Bear pole
Numa Creek	September 1985	Bear pole
Floe Switchbacks	September 1985	Bear pole
Kaufman Lake	September 1985	Bear pole
Ottertail Pass	July 1985	Bear pole
Tokumm Creek	July 1985	Bear pole
Helmet/Ochre Junction	July 1985	Bear pole
Tumbling Ochre Junction	July 1985	Bear pole
Verdant Creek	July 1986	Bear pole
Dolly Varden	July 1986	Bear pole
Redstreak Campground	May 1985	Cement block building
McLeod Meadows Campground	May 1986	Cement block building
Marble Canyon Campground	May 1986	Bear pole
Crooks Meadow Campground	May 1986	Bear pole
Trail crew camps	May 1984	Steel food boxes

Table 10. Example of actions planned for food storage facilities in Kootenay National Park. Note that 3 types of facilities are used.

Aversive Conditioning of Bears
Kootenay National Park 1985-89

Aversive conditioning is recognized as a logical first order deterrent for problem bears.

Approved forms of aversive conditioning are as follows:

- loud noises (shout, horn, siren, etc.)
- threatening gestures (short, noisy run at bear)
- throwing rocks
- bird shot
- rubber bullets

Bird shot or rubber bullets may be applied only by senior, permanent Wardens. These techniques may be used only under very controlled and limited situations, wherein the safety of the visitor and the bear can be reasonably assured. Close attention should be given to the results of research dealing with effects of these (and other) forms of aversive conditioning.

At no time will visitors be advised or encouraged to use any form of aversive conditioning.

Application of all methods of aversive conditioning, except loud noise, will be restricted to Park Wardens and used with discretion.

Application of aversive conditioning will be reported as a management action to the West Gate Information Centre and subsequently recorded on an Occurrence Report.

Table 11. Example of one strategy used by Kootenay National Park to deal with problem bears.

methods employed are area closures (Table 12), zoning through the master planning process, warning signs and manipulation of campground opening and closing dates to coincide with seasonal usage by bears.

This directive should indicate that the Division will employ visitor activity management to help reduce the potential for grizzly bear-people conflicts. This management should be based on sound knowledge of visitor use patterns and seasonal bear habitats and their use.

Action should be formulated in master planning (zoning) and in the bear-people management plans. Kootenay National Park's bear management plan provides up-to-date information on approaches such as the use of bear warning signs. Kootenay also takes into account forest fires as part of visitor activity management. A wildfire in the area of a trail could change a previously marginal habitat into a well-used bear feeding site and thus increase the bear hazard.

Some park managers in other jurisdictions are reluctant to use trail closure signs because of the potential liability involved in re-opening the trail. But allowing public access when a hazardous situation is known creates undue risk.

15. Staff Training

It is desirable that most of the staff members working in parks where grizzly bears occur have a general knowledge of

grizzly bear ecology and the standard practices for avoiding bear problems. Poorly-trained staff could mishandle a bear problem or give incorrect information to park visitors.

This directive should emphasize the necessity of staff training to the success of the grizzly-people management program.

Action should provide more thorough training of field staff (including firearm training for backcountry rangers) and general training of others involved in bear management. For example, the "bear management warden" in Kootenay National Park must have in-depth training while trail crews and garbage pickup crews must attend at least one general training session.

16. Research

Many agencies now recognize that sound grizzly bear management must be based on scientific knowledge. This is well summed up by an Alaskan study plan: "effective management of this species will entail: increased knowledge of its ecological and behavioral requirements, population status, and bear-human interactions..." (Schoen 1986). In Glacier (Mont.) and Yellowstone National Parks permanent research staff conduct long-term grizzly bear studies. Parks Canada has sponsored some grizzly bear research in the mountain national parks. This research indirectly provided the methodology for habitat evaluation studies in 3 B.C. provincial parks. Other

III. GRIZZLY BEAR-PEOPLE MANAGEMENT PLANS

Although "bear management plan" is the common usage, we prefer to use "bear-people management plan" because people are managed more so than bears.

Bear-people management plans are now considered essential for many larger North American parks, including Canadian national parks. These plans include all bear species present. The objectives of such plans are to state goals, outline procedures, and delegate responsibilities at the field level. They outline specific actions such as procedures to deal with a bear mauling or procedures for garbage collection.

The Western Region of Parks Canada is apparently shifting the direction of bear-people management plans from comprehensive plans for each park to a regional bear-people management plan. This would be accompanied by brief operational plans for individual parks (Volkers, pers. comm.). A similar approach would be advantageous to B.C. Parks.

A bear-people management plan should be implemented for each district where grizzly bears occur, with shorter operational plans for the larger parks with high visitor use such as Mt. Robson and Wells Gray Parks. This would be similar to the strategy already started by the West Kootenay District.

The district plans would provide the framework for priority management actions in both the small and large parks important to grizzly bears. Such an approach would have the advantage

We realize that all of the essential elements cannot be implemented immediately. They should be phased in over time. The Kootenay Park plan sets priorities to reflect their more urgent needs such as monitoring, waste management, food storage management, research planning, public information, and regional management.

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APPENDIX A

Insofar as new park areas are concerned, this table was updated to March 1, 1987. New recreation areas and boundary revisions created during March were not included. The status of grizzly hunting was based on the Wildlife Branch's 1986 game regulations. Grizzly bear densities were based on the Wildlife Branch's 1979 grizzly management plan (N=None, F=Few, M=Moderate and P=Plentiful). Representative landscapes are described in more detail in the 1982 report (Anon.).

Table 13. Status of grizzly bears in larger provincial park areas over 1000 ha.

<u>Dist. & Park</u>	<u>Class</u>	<u>Size(ha)</u>	<u>Hunt-</u> <u>ing</u>	<u>Dens-</u> <u>ity</u>	<u>Est.</u> <u>Pop.</u>	<u>Rep. landscapes</u> <u>& Comments</u>
<u>SOUTH COAST REGION</u>						
<u>Strathcona District</u>						
						No prov. parks on mainland
<u>Garibaldi/Sunshine Coast District</u>						
Garibaldi	A	194,939	No	F	4	A 1. Near extinct
Golden Ears	A	55,594	No	F?	1?	A 4. "
Mt. Judge Howay	RA	6,180	No	F?	0?	A 4. Near extinct?
Mt. Seymour Desolation	R&A	3,508	No	N	0	A 4. Extinct
Sound Marine	R&A	8,256	No	N?	0?	B 8. Extinct
Birkenhead Lake	A	3,642	No	F	<1	A 5. Near extinct?
Cypress	A	2,996	No	N	0	A 4. Extinct
Sasquatch	A	1,220	No	N	0	A 4. Extinct
<hr/>						
Total parks:	8	276,335	hectares			
<hr/>						
<u>Fraser Valley District</u>						
E.C. Manning	A	71,400	No	F	1	A5,A4. Near extinct
Skagit	R&A	32,508	No	F	<1	A 4. " "
International Ridge	R	1,905	No	N	-	B 10. Extinct
<hr/>						
Total parks:	3	105,813				
<hr/>						
<u>TOTAL IN REGION: 11</u>		<u>382,148 hectares</u>				
<hr/>						

Total Parks: 8 137,028 hectares

TOTAL IN REGION: 21 944,667 hectares

Dist. & Park	Class	Size(ha)	Hunt- ing	Den- sity	Est. Pop.	Rep. landscape & comments
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NORTHERN REGION

Cariboo District

Tweedsmuir**	B	981,120	No	M	76	F 27, G 30, G G 31, A 6, A 1 A 2. Highly In
Bowron Lakes	A	123,117	No	M	10	E 21, K 40.
White Pelican	A	1,247	No	N	0	G 31.

Total parks: 3 1,105,484 hectares
** 1/2 is administered from Skeena District

Prince George District

Mt Robson	A	219,829	No	M	17	N 46. Important
Mt. Terry Fox	A	1,930	No	M	<1	N 46
Carp Lake	A	19,344	Yes?	M	1	G 30. "

Total parks: 3 241,103 hectares

Skeena District

Spatsizi Plateau Wilderness	A	659,650	Yes	M	51	L 43, F 28. Im
Atlin	R&A	271,140	Yes	P	52	L 41, A 7 "
Mt. Edziza	R&A	232,695	Yes	P	45	L 44. "
Tatlatui	A	105,826	Yes	M	8	L 43, F 28. "
Gitnadoix River	RA	58,000	No?	M	4	G 31. "
Babine Mts.	RA	32,400	No?	M	3	F 26. "
Boya Lake	A	4,597	Yes	F	<1	H 36 ?
Kinaskan Lake	A?	1,800	No	P	<1	L 43. "
Kitsumkalum Mt.	R	1,538	No	F-M?	0?	A 2. Not know

Total parks: 8 1,367,646 hectares

APPENDIX B

Table 14. Smaller provincial parks under 1000 ha in grizzly bear range. Wildlife Branch grizzly bear densities in brackets. [F=Few, M=Moderate, and P=Plentiful].

SOUTH COAST REGION

Coquihalla (F)
Princess Louisa Marine (F)

SOUTHERN INTERIOR REGIONOkanagan District

Mara (F?)
Pennask Lake RA (F?)
Mabel Lake (F)

West Kootenay District

Arrow Lakes (F)
Boundary Creek (F)
Christina Lake (F?)
Cody Caves (F)
Conkle Lake (F?)
Drewie Point Marine (F)
Fry Creek Canyon RA (F?)
Jewel Lake (F?)
Johnstone Creek (F?)
Kettle River RA (F?)
Kootenay Lake (F?)
Lockhart Beach (F?)
McDonald Creek (F)
Midge Creek Marine (F?)
Nancy Greene (F?)
Ole Johnson Marine (F?)
Pilot Bay Marine (F?)
Rosebery (F?)
Ryan (F?)

Thompson River District

Cinnemousun Narrows (F)
Downie Creek (M)
Martha Creek (M)
North Thompson River (F?)
Seton Portage Historic (F?)
Shuswap Lake Marine (F?)
Spahats Creek (F)
Victor Lake (F)
Yard Creek (F)

East Kootenay District

B & J Gadsen (F?)
Crowsnest (F?)
Elk Valley (F)
Marl Creek (F?)
Mount Fernie (M)
Norbury Lake (M?)
Premier Lake (M?)
Thunder Hill (F?)
Yahk (F?)

APPENDIX C

The collective views of B.C. Parks' staff on grizzly bear preservation and management in provincial parks

The following is a presentation of interviews of 40 B.C. Parks' employees regarding grizzly bear preservation and management in provincial parks. These interviews were conducted informally from July to October, 1986 in Victoria, the Southern Interior Region and the Northern Region. Staff in the Southern (Coastal) Region were, regrettably, not interviewed. This information is segregated according to 19 relevant topics. Unfortunately, some of the topics were not covered in some of the interviews because of lack of time.

I have endeavoured to accurately represent the collective views expressed by the various staff. Some minor editing was done without changing the meaning of what was said. The accuracy of this representation of staff views was checked by soliciting their comments on a draft of this review.

1. The Importance of the B.C. Parks System to the Overall Preservation of the Grizzly bear

Staff members in Victoria generally gave a high priority to the value of the B.C. Parks system to the overall preservation of the grizzly bear.

Several relevant comments were:

"Grizzlies should be treated as special creatures and not as vermin shot in dumps. For many of the conservation-minded public committed to wilderness, the grizzly symbolizes the pinnacle of the wilderness concept. Therefore, the Parks Division has a moral responsibility and wilderness mandate to serve this concerned public by preserving grizzlies. The grizzly should be managed from this philosophical base."

and:

"Overall, B.C. and Alaska combined will have an extremely important role in the next 50-100 years in terms of grizzly bear conservation. B.C.'s provincial and national parks as 'the wilderness system' will play a large part in any conservation strategy for grizzly bears and their habitat."

Another reason stated for the importance of B.C. Parks to preservation of the grizzly is that grizzly habitat and populations are shrinking in the province from cumulative impacts which increases the value of protecting grizzlies and their habitats in provincial parks.

also expressed that while the Division has a commitment to preserve natural resources in parks, they are not "grizzly bear sanctuaries..... parks are for people". Compromises have to be made when it comes to a choice between people and grizzlies in parks. For example, "low value recreation areas with good grizzly habitats should be for grizzlies but high value recreation areas with significant grizzly habitats should be for people". Another staff member pointed out the problem that exists with the Division's "first mandate" to preserve grizzly bear habitats when the grizzlies range over areas larger than most parks.

Staff members outlined some of the provincial parks they considered important to grizzly bear preservation. Mt. Robson and Mt. Assiniboine Provincial Parks will soon be incorporated into this Rocky Mountain World Heritage Site (inferentially giving these parks international recognition, including the grizzly bear resource). As well, the new Akamina-Kishenina Recreation Area is important to the Waterton Ecosystem and Glacier Park, Montana. Wells Gray was considered one of the most important southern parks for grizzly preservation because of its large area. Also, in the West Kootenay District, Kokanee and Valhalla Parks were felt to be "key" to the preservation of grizzlies because they incorporate the more southerly ecological systems.

2. Potential Threats to Grizzly Bears in Parks

In Victoria, concerns were raised about the long-term survival of the grizzly bear in provincial parks. For example, it was pointed out that the grizzly has probably been extirpated from some of the major parks in southwestern B.C. such as Garibaldi. As well, "provincial grizzly populations are declining, probably from cumulative impacts, while developments and people use in parks are increasing". It was felt that this increasing development of parks could be "setting up conflicts" unless careful planning was done to avoid important grizzly habitats. There was also concern that the Wildlife Branch "was not doing an adequate job of reducing harvest levels" as they have stated they would. Overharvesting around Tatlatui Park was cited as one concern where grizzly populations could be threatened.

Northern Region personnel were concerned about the apparent decline of the grizzly population in South Tweedsmuir Park despite the long-term closure of grizzly hunting. Some staff members in the Southern Interior Region expressed concern for the survival of grizzly bears in parks unless better grizzly-people management was exercised with more staff and funding. It was also pointed out that the grizzly population has apparently been killed-off from the mountains which include the Nancy Green Recreation Area. Another employee felt that poaching of grizzlies, such as in the East Kootenays, could

They felt these have helped create their management style and provided a better basis for master planning and site-specific management actions (e.g. seasonal trail closures, etc.).

5. Park Areas of Concern

As part of the interview program, park employees were asked to identify problem sites within parks where grizzly bears and/or public safety should be given serious attention in the immediate future. These concerns were not prioritized.

a) Northern Region

-Atnarko River in Tweedsmuir Park. Specific concerns include:

- 1) An apparent decline of the grizzly population over the past 20 years.
- 2) Potential conflicts between grizzly bears and fishermen/hikers.
- 3) The potential grizzly/human conflicts at the Atnarko Campground.

-Meziadin Park. Despite excellent efforts by regional staff to minimize potential conflicts at the new campground, they do anticipate some problems with grizzly bears.

-Monkman Park. There was serious concern regarding the possibility of conflicts resulting from increased visitation in areas of prime grizzly bear habitat.

-Parks with large alpine habitats (e.g. Spatsizi). Here hikers face a risk of grizzly encounters (e.g. a grizzly on a kill) in areas where there are no trees to climb.

-Mt. Robson Park. Staff felt they needed an overall grizzly bear inventory or more short term practical information on grizzly bear habitats and hazards for proposed trails, etc.

b) Southern Interior Region

Staff identified at least 7 larger parks where more detailed grizzly bear information was needed:

-Wells Gray Park. The biophysical inventory did not include grizzly bears. Areas proposed for development urgently need evaluation of grizzly bear habitats and hazards.

-Monashee Park. There are plans to develop an alpine area for more backcountry use. Grizzly bear

out to the public. Master plans should also identify hazardous grizzly areas. Parks should "make it clear to the public that they are entering bear country at their own risk". As well, it was stressed that staff need to follow clear procedures in the event of a grizzly mauling.

Personnel in the Northern Region pointed out that a visitor to Bowron Lake Park tried to sue the Division after he fell off a wooden ladder at an elevated food cache at a campsite. The plaintiff lost his case but Parks changed to aluminum ladders.

Personnel in the Southern Interior Region felt the Division could be liable for not informing the public about known grizzly hazards in park areas. Public information for such areas should be a matter of public safety. Also, staff from Kokanee Park felt they were in a better liability position because they had used a consultant's report to help formulate their bear management program. It was also pointed out that once Parks recognized the liability involved with hazardous trees in campgrounds, a preventative program received special funding. A staff member felt that a similar approach should be applied to bear hazards.

7. Hunting of Grizzly Bears in Parks

Concern was voiced in Victoria that grizzlies might be over-hunted in some parks such as Tatlatui. It was felt that the Wildlife Branch should be abiding by their commitment to reduce provincial harvest levels of grizzly bears. As well, more accurate information was requested regarding the validity of the concept that grizzly hunting reduces grizzly/people conflicts by making the park bears slightly warier.

In the Northern Region it was pointed out that 18 guide/outfitters operate in the northern parks. Staff reviews the annual kill rates which are conservative (3% of population estimate). However, there was concern that population data for northern parks is sometimes inadequate. According to some employees grizzly populations are stable but an opposing view contended that populations are declining.

Opposite views were also expressed over the issue of grizzly hunting in provincial parks. One view held that grizzly bear hunting in provincial parks fulfilled the Division's mandate to "maximize recreational opportunities". It was pointed out that the Wildlife Branch maintains a policy of optimizing hunting opportunities but Parks manages grizzly hunting with a different objective. For example, Parks incorporates "social considerations" as was shown when hunting was recently closed in Mt. Robson Park because of

management of grizzlies in provincial parks such as in the handling of problem bears and the establishment of grizzly hunting quotas. However, it was also pointed out that some problems occurred as a result of individual attitudes. It was suggested that there be provincial interagency procedures.

Staff in the Northern Region indicated good co-operation with the Wildlife Branch although this depended on individual personalities. However, it was stressed that Parks' role be strengthened and "shady areas" between the two agencies clarified. In Tweedsmuir Park, the Division also worked with Federal Fisheries on potential grizzly bear concerns at an artificial spawning channel for salmon.

According to the Southern Interior Region staff, there has been participation in co-operative management when necessary. Most effort has been with the Wildlife Branch. Staff indicated that joint bear management definitely requires a greater emphasis. For example, in the West Kootenay District, staff wished to work more closely with the Wildlife Branch in setting hunting quotas for grizzlies in parks. In the East Kootenay District it was pointed out that Parks already co-operates with the Wildlife Branch in sheep surveys and this co-operative approach should be used to monitor grizzly populations; "collectively, this would cut down on costs". It was also pointed out that "as an agency, Parks is quite used to liasing with other agencies, unlike national parks staff."

9. Co-ordinated Ecological System Management

Several of the staff members interviewed in Victoria stressed the importance of managing grizzly bears in ecological systems, not just within park boundaries. It was also pointed out that few parks will encompass the full range of habitats for a viable population of bears which means that management should co-operate with other agencies (around parks). It was recommended that there be guidelines for collective management where grizzly bear habitat spreads over 2 or more jurisdictions beyond park boundaries: "land use activities adjacent to parks should be considered".

Staff in the Northern Region did not express much interest in co-ordinated management around northern parks. They did point out that in the past they have co-operated with other agencies such as the Jasper Warden Service in the release of black bears in or near Mt. Robson Provincial Park.

In the Southern Interior Region it was stressed that "most of the emphasis in the future will be in a co-ordinating role". In the West Kootenay District it was felt that Parks should be doing more co-ordinated management such as meeting with

-Interpretive programs are now contracted out without any guidelines to prepare bear talks. Many interpreters are seasonal. Bears are a fairly popular topic and programs could be used as a "drawing card".

-Park rangers have no consistent information to pass on to the public.

-Information on grizzly bears habitats needs to be given to the public. Last summer someone took a group of Germans up Alnus Creek in Hamber Park and they had some run-ins with grizzlies.

-One of the problems in up-grading public information has been a lack of funding.

The following suggestions were made by park staff for the improvement of a public information program on grizzly bears:

- a) Visitor Services needs to be making a much greater effort on public information about grizzly bears.
- b) Public information on grizzlies should be along two mainstreams: "the awareness, understanding and support for preservation, the place of bears in the universe, habitat values, etc." and "information to allow people to safely recreate in bear habitat, such as identification of key habitat areas, bear behaviour and how to avoid problems with them."
- c) If necessary, Victoria could prepare a packaged bear slide-show for use in the Districts.
- d) There should be a large-scale public relations-media campaign on grizzly bears funded by B.C. Parks and other associated resource agencies. The program could include other agencies in western Canada such as Parks Canada. Television and videos would be used in educating a wide segment of the population. A series of short T.V. ads could feature "Bears in B.C." and then highlight bear safety in parks such as "The Seven Golden Rules for (safe) Behaviour in Bear Country". Short messages could explain the proper disposal of fish offal, etc. Bear videos could be produced for interpretive programs for schools.
- e) The Parks' pamphlet on bears should be up-dated with greater emphasis on grizzly bears. Brochures for individual parks should identify hazardous grizzly areas.
- f) Bear ecology displays should be a major attraction at Nature Centres.

"It is all the better if we can perfect tools to avoid key grizzly habitats as instances are known where trails were located through grizzly habitats to public detriment. Zoning can also be used to avoid sticking people use in high hazard grizzly bear areas".

"The trend of increasing visitor use is a concern. People use is one of the important reasons for the existence of parks, but parks also have preservation values. This is why it is essential to identify key grizzly areas in parks and say 'That's bear country' and it is for bears and not allow major facilities in grizzly habitats. Also the public should be made aware that this area is preserved as grizzly habitat".

"When building or replacing new visitor use facilities parks, it should be determined, if possible, how the area is used by grizzlies and how it fits into things. This is necessary and such studies should be part of the design and planning costs. We need to learn from the mistakes of the past".

The need to consider the impacts of the facilities on grizzly populations was also stressed.

As well, it was pointed out that such information can be used to identify areas of special significance to grizzly bear preservation. After the Wildlife Branch identified the Angus Horne Lake area of Wells Gray Park as important to the long term survival of grizzlies in that ecological system, Parks zoned the area as a Nature Conservancy.

In the Northern Region views varied considerably, but there was moderate agreement that information on grizzly bears and their habitats should be considered in new park developments. However, this was not given as high a priority as in Victoria and the Southern Interior Region.

While no specific studies of grizzlies have been used in planning and management in Northern Parks, the northern staff collectively demonstrated a good general knowledge of bears which they have applied constructively to some park situations to help reduce people/grizzly conflicts. They considered this part of their "pioneering", "common sense" and "hands-on" approach. For example in Mt. Robson Park construction of a trail was stopped because of bear habitats, and an area of the upper Fraser River was zoned primitive because it was a known grizzly area. In the case of the new Meziadin Campground along Highway 37, regional staff applied their general knowledge of grizzlies and their habitats to site location, design and management. In Bowron Lake Park, staff members use information that grizzlies feed on spawning salmon in the upper Bowron River area to

Park staff throughout the Southern Interior Region also felt that specific grizzly bear habitat/hazard information was required for many other park areas. It was also pointed out that the evaluation of grizzly bear habitats and people/grizzly conflict potential should be incorporated as guidelines at the provincial level such as in the context of master planning. Such guidelines should specify the detail of grizzly bear information necessary for a plan or management action to be professionally acceptable. The level of information required should be realistic and useful and not necessarily as detailed as the Parks Canada biophysical inventory. Also, "flexibility in these guidelines is necessary".

12. Food and Garbage Management

The handling of problem grizzly bears is discussed under that section.

In general, personnel in Victoria felt that field staff members were competently handling the storage and disposal of food and garbage in parks to reduce bear problems. The closure of the dump in Manning Park was cited as one example where garbage management had improved over the years. However, there was concern that no standard guidelines exist for managing food and garbage in grizzly country.

Amongst Northern Region personnel there was a consensus that good food and garbage management was the "key" to minimizing problems with grizzlies. They related that good management resulted from improved handling of food and garbage at campgrounds (e.g. Meziadin and Atnarko), an improved attitude amongst most park visitors and the closure of most garbage dumps. However, it was pointed out that there is still a land disposal dump in Muncho Lake Park which lead to the shooting of 2 grizzlies in 1982. This dump still creates a few black bear problems. However, the staff was not aware of any dumps adjacent to northern parks that contribute to problems with grizzlies inside parks.

Several examples were given of the positive steps in food and garbage management in northern parks. Prior to 1979, poor food and garbage management at the numerous campsites and the canoe portages in Bowron Lake Park lead to serious black bear problems. Some bears would even wait on shore to meet canoes. At one period, up to 15 black bears were shot, but after affirmative action by Parks, problems have been reduced to the handling of 1-2 black bears annually. The 1979 rehabilitation program included the installation of 49 elevated food caches at campsites and canoe portages, elimination of problem black bears and a public education program. The latter includes a display of a food cache at the entry parking lot and an orientation slide show with some

guidelines that specify proper food and garbage handling at their camps.

-There were also concerns about the improper storage of food and garbage at backcountry camps for trail crews. In 1984, the crew constructing the Woodbury Hut stored their food in a tent in a known grizzly area but later hung it in a tree. In 1986, a trail contractor in Valhalla Park also stored food in a tent in a camp in known grizzly habitat. Field staff recommended that backcountry crews be given guidelines on proper food and garbage handling. For contractors, failure to comply with these would result in a penalty as stipulated in the contract.

14. Carrion Management

Field staff expressed concern over the lack of a policy to cover the death of a park visitor's horse in the backcountry since dead horses attract grizzlies. A policy should clearly define responsibilities for disposal of domestic animal carcasses.

Also, staff felt some information was needed on management of wild animal carcasses such as elk and moose. In the fall some hunters leave remains of game.

15. Problem Bear Management

This refers to the handling of grizzly bears that have become a nuisance because of conditioning to human foods or garbage or for other reasons. Handling of grizzlies involved in maulings are discussed in the next section.

Personnel in Victoria thought that problem grizzly management in provincial parks had improved somewhat. However, shooting a problem grizzly was "not a good way to represent Parks management of bears". Therefore, it was preferable to relocate problem grizzlies, from a public relations as well as a biological point of view.

In the past, staff members were trained to use tranquilizer guns but lost interest after 2-3 years. This left the handling of most problem grizzlies up to the Wildlife Branch. Staff recommended better procedures between agencies and guidelines for the handling of problem grizzlies.

According to staff in the Northern Region, problem grizzlies are usually given 2-3 chances, unlike problem black bears. However, in the event of doubtful circumstances surrounding a grizzly problem, public safety is given priority. Consultation usually occurs with the Wildlife Branch. Some northern park employees felt that they didn't need specific instructions to handle problem bears. They pointed out that

Details provided by various staff members indicate that there have been 3 grizzly maulings in the northern region since the early 1970's:

-a park naturalist was mauled by a grizzly in Mt. Robson Park in the early 1970's

-two wildlife biologists were mauled by a mother grizzly in Spatsizi in 1976.

-an insect researcher was eaten by a bear, apparently a grizzly, in Liard Hotsprings Park in 1981.

One staff member reported that 6 black bears were destroyed in the search for the killer bear at Liard. It was indicated that public safety is a priority and there is an unwritten policy to shoot any grizzly involved in a mauling. One manager in the Southern Interior Region also felt that any grizzly involved in a mauling would be destroyed, not just to appease public sentiments, but because of the lack of funding to relocate bears.

As with other problem grizzlies, personnel in the Southern Interior Region were also concerned about the lack of trained rangers and guidelines to deal with bear attacks. One concern was that although the Wildlife Branch normally deals with maulings, backcountry rangers would most likely be closest to the sites. It was pointed out that in Kokanee Park (where some grizzly/human encounters have occurred), a 12-gauge shotgun is normally left at the ranger cabin for emergencies. However, the gun was apparently removed last year because the seasonal ranger was not trained to use it.

Parks employees reported that a minor bear attack occurred just outside Top of The World Park in the summer of 1986. They felt that the Fish and Wildlife Division's follow up was tardy. Also, they pointed out that they were not positive the bear involved was a grizzly and that the wrong area of the park was initially closed to the public. As a result, the seasonal ranger for Top of The World Park drafted a bear action plan to deal with future incidents.

Others also desired a bear incident plan that specified the correct procedures. Another concern expressed was the necessity of dealing with the media after a bear attack in a park.

17. Staff Training and Responsibilities

In Victoria it was pointed out that some bear information is given to staff during orientation courses. However, personnel in both Victoria and the Southern Interior Region expressed a need for a training program in grizzly bear

provincial parks, population census techniques, safe hunting quotas, bear repellents and deterrents and the potential for using artificial food sources to hold grizzlies in certain areas.

The Northern Region requested information on methods of grizzly bear habitat/hazard evaluation, population census methods, aversive conditioning and the use of "bear spray" (repellent), 12-gauge plastic slugs and noise makers.

The Southern Interior Region asked for information on bear management training for staff, types and value of bear warning signs, systems for recording grizzly bear sightings, population censusing and determination of "surpluses", best type of food cache and optimum distance of food caches from campground, up-to-date interpretive programming and videos on bears and public safety, best type of firearm, and effectiveness of bear bells used by hikers.

31) and the northern 1/3 of Fraser Basin and Plains(G 29) would appear to offer the best opportunities for park representation that would include grizzly bear preservation. In the Thompson Plateau (G 33) a small "island" population apparently exists between Kelowna and Merritt. Grizzly-cattle conflicts have probably resulted in the loss of most of the grizzly population from this landscape. Careful management in the U.S. has demonstrated the potential of co-existence of grizzlies and livestock in some areas (Jonkel pers. comm.).

-B 10. The Fraser Flood Plain landscape extends from near Hope to the city of Vancouver. Riparian habitats and salmon streams mean these productive lowlands were probably of historical importance to grizzly bears. Because of dense human settlement, the grizzly is gone forever from this landscape except in the Stanley Park Zoo.

-I 37. The Lillooet-Clinton Mountains landscape may have a few grizzlies on the west side of the Fraser River but no grizzlies on the east side. Any future parks should consider representation of grizzly bears and their habitats.

b) Nil or Low Priority For Additional Representation

There are 9 in this category, as follows:

-A 1. A moderate to plentiful density occurs in the northern 2/3 of this large rugged Pacific Range landscape, which includes a small southwest corner of Tweedsmuir Park. The southern 1/3, which includes Garibaldi Park, has few to no grizzlies although historically they were probably abundant. This landscape should not be considered adequately represented when a major wildlife species has been almost killed-off from Garibaldi Park.

-A 4. The grizzly has been almost killed-off from the Lower Mainland-Skagit Mountains landscape to the north of the Fraser River where it is represented by Golden Ears Park and Mt. Judge Howay Recreation Area. These park areas are contiguous with Garibaldi Park. South of the Fraser River, the landscape is represented by Skagit Valley Recreation Area and the western sector of E.C. Manning Park where severe grizzly population declines have also taken place. Grizzly habitats may be well represented in this landscape, but not populations.

-A 5. The Coast-Cascade Dry Belt is a large landscape in the southern interior. A moderate density of grizzly bears is still supported in the northern one-half whereas they have been almost decimated in the southern half which includes E.C. Manning (e. half) and Cathedral Parks along the U.S. border. This landscape cannot be considered adequately

landscape is significant to grizzlies but their range is being impacted by agriculture, logging and oil and gas exploration. Despite the fact that these large forested plateaus (P51 and 52) have only a few small parks, the Division has assigned them a low priority for additional representation, perhaps because of low recreational values. However, because these landscapes probably have grizzly habitats unique to B.C., adequate representation would be of high conservation significance. [Perhaps representation could be done co-operatively with Alberta and the Northwest Territories which share this landscape with B.C.]

4. Landscapes With Moderate to Plentiful Grizzly Bear Densities

a) Low-Moderate, Moderate or High Priority For Additional Representation

There are 12 regional landscapes and 1 marine environment:

-A 3 and m.e.#1. The Coastal Fiords landscape and the associated marine environment # 1 include most of the B.C. mainland coast. The density of grizzly bears is high. Grizzlies have been extirpated from the Pacific Coast in the U.S. and southwestern B.C. They once occurred as far south as California. Any future park designations on the mainland coast should give a high priority to representation of the coastal grizzly and its rich diversity of habitats. This would be of international value.

-A 2. The large Kitimat Ranges landscape has a moderate to plentiful density of grizzly bears. A special feature would be grizzlies feeding at salmon streams. The landscape is represented by the n.w. fringe of Tweedsmuir Park and the new Gitnadoix River Recreation Area. This landscape also includes most of the Wildlife Branch's no-hunting grizzly reserve (3850 sq km) for the coastal ecological system which centres on the Khtzeymateen valley. This reserve protects a core population of 70-80 grizzlies (van Drimmelen 1984). Although the Gitnadoix adds some grizzly habitats it lacks a coastal estuary, intertidal zone and expanses of Sitka spruce that provide some of the unique grizzly habitats on the coast. Representation of grizzly bears in this landscape must therefore still be considered inadequate.

-A 6. The Western Chilcotin Transition Belt landscape has mostly a moderate density of grizzlies. Only a small portion of this landscape is preserved by s.e. Tweedsmuir Park. A high priority should be given to providing adequate representation of grizzlies in this landscape.

-D 17 to D 19. These 3 regional landscapes are found in the Cassiar-Omineca area of northern B.C. Together they form a

Parks felt this landscape had adequate representation because of Atlin Park and Recreation Area and Kluane Park in the Yukon. The Chilkoot Trail National Historic Park (13,500 ha) was also recently set aside. This landscape is also important in the context of grizzly populations in the adjacent large tracts of protected wilderness in Alaska and the Yukon.

-D 20. This includes low elevation grizzly habitats in the Northern Rocky Mountains Trench. Better representation should be provided within the B.C. Parks system.

-E 21, E 22 and E 23. The moist climate of these Columbia Mountains landscapes fosters productive grizzly habitats. They have a generally moderate density of grizzly bears but numbers are reduced to few or none in pockets near the U.S. border. These landscapes are well represented in parks. The 1983 addition of Valhalla Park completed representation of E 23 (Whitfield, pers. comm.). About 1/2 of the Northwest Columbias landscape (E 21) is incorporated within the boundaries of Bowron Lake and Wells Gray Parks. The High Columbias (E 22) is represented by a portion of Wells Gray, a portion of the Purcell Wilderness Conservancy and Bugaboo Park and Recreation Area. But grizzly preservation in this landscape is best served by the larger Glacier National Park. The smaller Mt. Revelstoke National Park also includes this landscape as well as the Southern Columbias landscape (E 23). E 23 however, is best represented in the large Purcell Wilderness Conservancy, and to a lesser degree, Valhalla Park. Valhalla, unlike the other parks which are generally at higher elevations, includes low elevation grizzly bear habitats.

-F 28 and L 43. These northern B.C. Parks landscapes have a moderate to plentiful density of grizzly bears. Grizzly bears are extremely well represented by Spatsizi-Tatlatui Parks which encompass a large contiguous area of good grizzly country.

-H 36. The Liard Plain landscape has a low density of grizzlies. While the 1982 Parks report considers representation of this landscape to be near-adequate, the small Boya Lake Park would hardly provide adequate representation for the area's grizzly bears and their habitats.

-L 41 and L 44. The grizzly density is rated plentiful in these two northern landscapes. The large Tagish-Taku Dissected Plateau (L 41) is represented by the east half of Atlin Park and a portion of Mt. Edziza Park and Recreation Area. The small Mt. Edziza Shield Volcano special landscape (L 44) is almost totally included in Mt. Edziza Park and Recreation Area.

APPENDIX E

Review of B.C. provincial parks' role in Parks Canada's terrestrial and marine natural regions

The following evaluates B.C. provincial parks in the context of the 9 Parks Canada natural regions and 3 marine environments which occur in B.C. Information was obtained from the Parks Canada system planning manual (1976) and Henwood (1985).

1. Pacific Coast Mountains Terrestrial Region(1) and Queen Charlotte Sound (M 3) and Vancouver Island Inland Sea(M 2) Marine Regions

Some of the highest densities of grizzly bears in Canada probably occur in the coastal mountains of region 1. Productive bear habitats include climax rain forests and salmon spawning areas. In the marine environments the intertidal zone and rich estuaries add important habitat components to the coastal grizzly ecological system.

Unfortunately, this is not well-represented in either of the provincial or national park systems. The one large national park on the entire B.C. coast is Pacific Rim and this is on Vancouver Island where grizzlies have never occurred. The 7 large provincial parks in this natural region are inland from the coastline and thus do not protect the dynamic life zones where grizzlies use habitats by the sea.

The Garibaldi-Golden Ears-Howay and Manning-Skagit park complexes provide some representation but their grizzly populations have been almost extirpated. Nationally, Tweedsmuir and Gitnadoix River offer the most significant national representation because they have higher grizzly populations with the special feature of seasonal feeding on salmon.

2. Strait of Georgia Lowlands (Region 2)

This small natural region includes the Fraser Delta area. It is the only region of its kind in Canada. Extensive human settlement has resulted in the permanent loss of the grizzly bear from this entire region. It has no significant national/provincial park representation.

Kwadacha Wilderness may be nationally important because it is the only provincial park of any size to represent grizzly habitats and numbers at the northern extremity of the Rockies.

6. North Coast mountains (Region 6)

The majority of this region, which is productive for grizzly bears, occurs in B.C. Bear densities in this region are high. Atlin Provincial Park and Recreation Area is the only park representing this natural region in B.C.

7. Northern Interior Plateau and Mountains (Region 7)

Although this region covers a large area of northern B.C.'s grizzly bear range, it also extends over a larger area in the Yukon. The 1977 Wildlife Branch map indicates moderate densities of grizzlies. This region approximates the northern interior ecotype for grizzly bears identified by Pearson (1977). These grizzlies are typified by a smaller body size than bears in southern areas, a lower reproductive rate and greater age of first reproduction of females. The population density was calculated to be one grizzly per 22 sq km (Pearson, 1975). The large combined area of B.C.'s Spatsizi Plateau Wilderness and Tatlatui Parks form the second largest protected area of grizzly bear habitat in the province and provide excellent representation of grizzly bears in this natural region.

8. Mackenzie Mountains (Region 8)

Only a small section of this natural region occurs in B.C. It is not represented by a provincial park. However, Liard Provincial Park, cancelled in 1949, would have provided excellent national representation of grizzly bears because it was larger than Spatsizi.

9. Southern Boreal Plains and Plateau (Region 12)

B.C. contains a vast tract of this forested lowland where grizzly densities are low, about 1 per 518 sq km. There are some areas of extinction. This region contributes to the ecological diversity of B.C.'s grizzly bear range. No provincial parks of any size represent it. Nor are grizzlies and their habitats represented by any of the protected areas in other jurisdictions that include this natural region.

catastrophes." The definition is arbitrary in its specifics but it offers a concrete place to begin discussion regarding whether a given population is viable. There are five possible approaches for determining or inferring minimum viable population sizes: experiments, biogeographic patterns, theoretical models, simulation models, and genetic considerations (Shaffer 1981).

To use the experimental approach we would isolate populations of different sizes and see how long they survived. Clearly this approach is infeasible for grizzly bears at the present time.

A biogeographic method for estimating MVPs is suitable for species populations which are patchily distributed but periodically exchange genes. Some populations may periodically go extinct. Recolonization may occur. Extinction and recolonization -- rates can be specified. This approach isn't suitable for grizzly bears either because historically they occurred in large continuous populations and today, while becoming increasingly fragmented, they cannot periodically reinvade unoccupied habitat, and moreover the time duration of their fractionation is too short to allow for conclusions to be drawn regarding MVPs.

Simulation models are a third possible technique for estimating MVPs for grizzly bears. This technique was applied by Shaffer (1978) to the Yellowstone population using the data available from the Craighead era. Here Shaffer defined an MVP as one which had a 95% chance of persisting for 100 years. His results showed that populations of less than 30-70 bears (depending on population characteristics) occupying less than 2500-7400 km² (depending on habitat quality) have less than a 95% chance of surviving for 100 years. In order to estimate MVP size from Shaffer's simulation model accurate life table and reproductive rate data are needed.

Recently, the Yellowstone situation was further evaluated by Suchy et al. (1985). They used population data collected since 1975 under the direction of the Interagency Grizzly Bear Study Team. Population parameters had changed significantly since the Craighead era especially reflecting changes in reproductive and mortality rates after the closure of in park garbage dumps in the early 1970s. Depending upon which mortality estimates were incorporated into the model the new MVP estimate was 40 bears (low mortality estimate) and 125 bears (high mortality estimate). They like Tompa (1984) and Knight and Eberhardt (1984), pointed out: "The addition of a few mortalities can drastically change the population dynamics of the bears and result in an unstable population."

In interpreting the results of both the Shaffer (1978) and Suchy et al. (1985) models it is important to note that possible genetic effects from inbreeding were ignored as were the possible effects of natural catastrophe. We will show that given current opinion from geneticists the failure to include possible genetic effects could result in MVP size estimates far lower than if genetic effects were included.

In our analysis Shaffer's model was not applied to B.C. bear populations because sufficient data are not currently available. However, in the near future the results from the Flathead and Kimsquit studies should lend themselves to such an MVP simulation.

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survives to the mean age of reproduction and breeds (not all individuals of breeding age breed), and

L_M, L_F = the generation length, i.e., the mean age of all males and females, respectively, that reproduce in a population with a stable age distribution (Caughley 1977:123-124)."

First Situation

1. $M_{br} = 24$ (the number of breeding males)
 $F_{br} = 26$ (the number of breeding females)

The ratio is derived from Tompa's (1984) stated proportion of females in the B.C. Provincial grizzly bear population (52.6%). The actual numbers were arbitrarily chosen to reflect a substantial, but not major population.

2. $\bar{K}_M, \bar{K}_F = 1.65, 1.14$ (the number of young born to males and females, respectively, per year (see Reed et al. 1986).

In any given year, it was assumed that one-third (0.67) of the adult female breeding population was available, the rest either have offspring older than COY⁵ or skip a year in breeding since last weaning. The assumed reproductive rate is .76 (Tompa 1984). This is the average number of offspring per year, per adult female. However, according to the Reed et al. 1986 equation, since this number is shared with males, only .38, or $\frac{1}{2}$ of the reproductive rate, accrues to females. This must be multiplied

.2 was used. This was multiplied times .25 since only one-fourth of the males in the population would breed in a given year.

4. $L_m, L_f = 12, 11$ These figures represent the generation length, i.e. the mean age of all males and females, respectively, that reproduce in a population with a stable age distribution. The actual numbers are based on studies done in Yellowstone (Knight pers. comm.) as B.C. data were not available.

Therefore situation 1 becomes:

$$\frac{1}{N_e} = \frac{1}{4 \times L_M \times M_{br} \times \bar{K}_M \times \bar{L}_M} + \frac{1}{4 \times L_F \times F_{br} \times \bar{K}_F \times \bar{L}_F}$$

$$\frac{1}{N_e} = \frac{1}{4 \times 12 \times 6 \times 1.65 \times .05} + \frac{1}{4 \times 11 \times 8.67 \times 1.14 \times .0858}$$

$$\frac{1}{N_e} = \frac{1}{23.76} + \frac{1}{37.31}$$

$$N_e = 14.51$$

$$N_{br} = M_{br} + F_{br} = 24 + 26 = 50$$

N = Total population, including non-breeding individuals. Here it was assumed that females enter the breeding population at age 6, and males at age 8. Using Tompa's life table for females, 26 breeding age females would reflect a population of 49.4 total females. For males we had to use the female life table and to adjust it down slightly for Tompa's (1984) derived sex composition of 52.6%.

Therefore 24 breeding age males would reflect a population of 64.95 males. The total population estimate is $49.4_F + 64.95_M$

$$N = 114$$

