

# INDUSTRIAL AND AGRICULTURAL INCURSION INTO GRIZZLY BEAR HABITAT:

## THE ALBERTA STORY

Brian L. Horejsi

**ABSTRACT:** Agriculture, logging, and oil and gas exploration and development have recently made rapid inroads into grizzly bear habitat in the South Wapiti region of Alberta. The present administration has not instituted compensatory management programs. Hunting, through vastly improved access, has affected the population of marked bears. Until there are major changes in the attitude and actions of elected governments and land management agencies, bear habitat will continue to shrink. Populations can be expected to decline in response, leading to insular populations centered in our national parks. Necessary changes in philosophy and management are listed.

### INTRODUCTION

A recent article about grizzly bears (*Ursus arctos*) in the United States indicated that grizzly populations in Canada were secure (Turbak 1984). In fact, not all Canadian populations are secure. Grizzly populations in south and central Alberta are being disregarded by an increasingly antiwildlife provincial administration that has allowed intensive development pressures from three industries--agriculture, logging, and oil and gas exploration and development--without compensatory management. This paper presents illustrative data from an area roughly 40 km southwest of Grande Prairie, AB (fig. 1).

The study area is known as the South Wapiti. It is an area of extensive pine-spruce upland forests and aspen-shrub-conifer mixed forest in the lowlands. The South Wapiti ecosystem lies within two administrative land use zones--the green and yellow zones. This zoning, established in 1948 and at least partially based on land capabilities, was to define the limits to agricultural and residential development; the green zone being the area in which such developments were prohibited. In the yellow zone, agricultural and residential development was to be permitted provided the land was not required for conservation, forestry, recreation, or wildlife habitat. The study area lies entirely within the green zone, administered by the Alberta Forest Service, but is bordered on the immediate north by the yellow zone, administered by the Public Lands Division.

Paper presented at the Grizzly Bear Habitat Symposium, Missoula, MT, April 30-May 2, 1985.

Brian L. Horejsi is Wildlife Ecologist, Western Wildlife Environments Consulting Ltd., Calgary, AB.

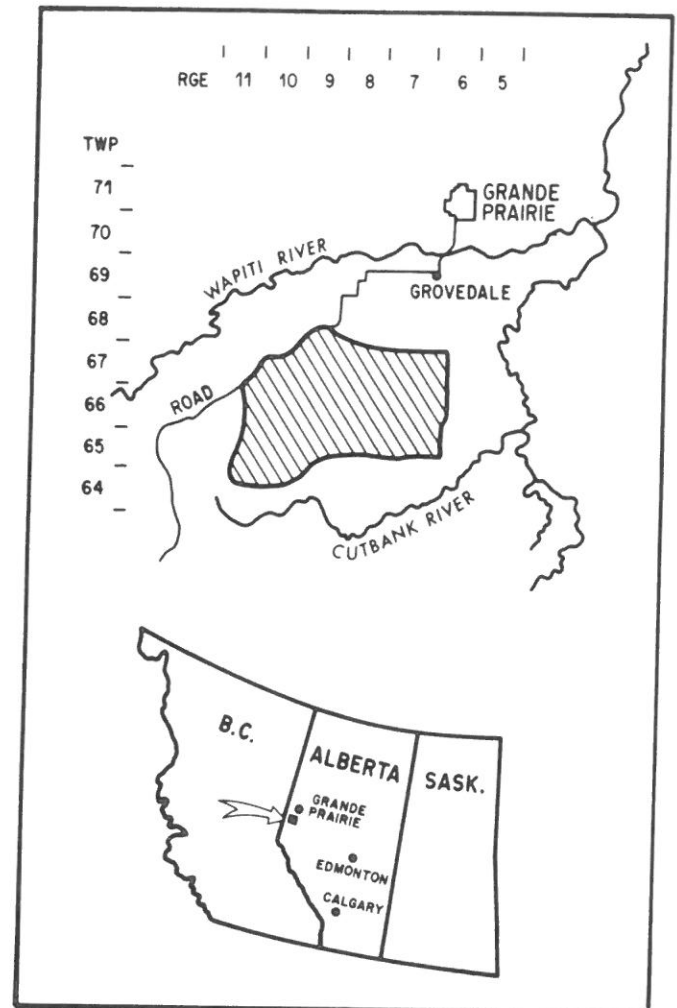


Figure 1.--Location of the South Wapiti study area.

In 1969 the provincial government signed a Forest Management Agreement (FMA) concerning lands in the study area. In 1978 an extensive and rich natural gas field was discovered underlying the area, and it is toward the South Wapiti that human habitation and agricultural activities are creeping. The impact of these three types of activity are herein addressed by documenting the changes that have occurred recently, presenting data on the marked grizzly bear population, and suggesting some remedies.

### POLITICAL CLIMATE: A HABITAT PARAMETER

Although there exists a clear separation in conservation philosophy between most biologists and

the politicians and senior administrators they work for, the role of most biologists in Alberta is to facilitate the actions of specific interest groups. They can act, therefore, only within very narrow limits, those limits being set by elected members of government. These limits can only be broadened by public education, public participation, and public activism.

In Alberta the prospects for wildlife conservation are extremely limited. This is not a narrowly held view. In 1984 a questionnaire was circulated to 150 residents of Grande Prairie and area; of 80 respondents, 51 provided a yes or no answer to the question, do you think our politicians care what happens to grizzly bears? Eighty percent said no!

Alberta does not have the advantage of large tracts of federal land or an Endangered Species Act to encourage wise bear management. We do not have the exceptional wilderness system, with prospects for its expansion (Edwards 1985), found in the United States. A policy that provided limited protection for grizzly bear habitat, the East Slopes Policy of 1977 (Alberta Energy and Natural Resources 1977), has been struck down by a Revised East Slopes Policy (Alberta Energy and Natural Resources 1984a). The East Slopes consist of a narrow strip of foothill and mountainous public land on the western edge of Alberta on which most of the Province's grizzly bears are found. The philosophy of the present administration is evident from the thrust of the revised policy, which states that:

1. "Resources extraction objectives such as those of trapping, logging, domestic (stock) grazing, petroleum, natural gas, coal, and mineral exploration and development may be achieved" in critical wildlife zones.
2. "The sale of parcels of public land for permanent and seasonal residential use may be considered."
3. "To expand domestic livestock grazing opportunities on public lands" is an objective in the area that includes the South Wapiti.
4. Should anyone wish to use public land in an area or a way that is presently not permitted, a request for a zoning change can be made.

Before eliminating the East Slopes Policy as an instrument for wildlife and land conservation, the Lougheed administration proceeded with public hearings into the expansion of agricultural lands in Alberta. This thrust has been incorporated into Integrated Resource Management Plans (IMP), the vehicles through which the Revised East Slopes Policy will be implemented. Such a plan is the Sturgeon Lake-Puskwaskau East IMP (Alberta Energy and Natural Resources 1984b), which affects lands that border the South Wapiti ecosystem on the northeast. Under this plan there will be a net transfer of 190 sections of land from the semiprotected green zone to the development-oriented yellow zone. The report states that "about 210 sections (54 000 ha) of high quality (wildlife) habitat will be lost to agricultural development." In addition to these settlement-cultivation losses, alternative lands will have to be found for displaced grazing rights. Such lands will come from the public land-wildlife habitat pool, creating an

impact far beyond the original development. Immediately north of the South Wapiti study area, where land is increasingly being transferred from public to private ownership, the "greatest limitation to substantial expansion" of agricultural activity is viewed as being the green zone boundary (South Peace Regional Planning Commission 1984).

The administration in Alberta has taken calculated steps to reduce the effectiveness of the Fish and Wildlife Division through staff reductions. In one district office where three people were present in 1980, there was only one in 1984. That office, in a 15-month period in 1980-81, received 609 applications for construction of oil and gas leases, access roads, and pipelines. During an 11-month period in 1984-85 the number of applications received was 528. On a monthly basis the number of applications to be reviewed rose from 15 to 48 for the single person present. Wildlife considerations were obviously much more superficially treated in 1984 than in 1981.

Wildlife research has also suffered in Alberta; three studies of grizzly bear populations under way in 1981 on Provincial lands had all been terminated by April 1985. Two were terminated prematurely by the Provincial government, with no plans for data analysis or reports.

## RESULTS AND DISCUSSION

### Agricultural Activity

In 1983 the Provincial government announced a plan for, and held hearings concerning, an expected million-square-kilometer expansion of the yellow zone. Such an ambitious scheme presents an extremely serious threat to the South Wapiti grizzly bear population. Even before the results of the hearings allow or deny a chance to alter green zone-yellow zone boundaries, there have been significant land use changes within the existing zones--changes already harmful to the grizzly.

The yellow zone on the northern edge of the study area (Township 69 and north) was originally all public land and all grizzly bear range. Agriculture has been identified as a factor impacting wildlife lands historically (Brown 1985; McCrory and Herrero 1982), and such is the case in the Grovedale area (fig. 1), where agriculture began in the 1930's. It is somewhat surprising, though, that the majority of agricultural expansion occurred not a long time ago but within the last 15 years. The transfer of grizzly habitat to private ownership skyrocketed in the 1970's, when 48 percent of all the land ever to come into private ownership in the study area was lost to government control (fig. 2) and, coincidentally, to grizzly bears. With those rapid changes in land control came a 213 percent increase in human population; where 258 people resided in 1961, 854 lived in 1982 (South Peace Regional Planning Commission 1984).

In the mid-1960's an even more serious threat to grizzly bears developed. Two grazing leases were established in the green zone, one in the heart of the study area and one to the northeast.

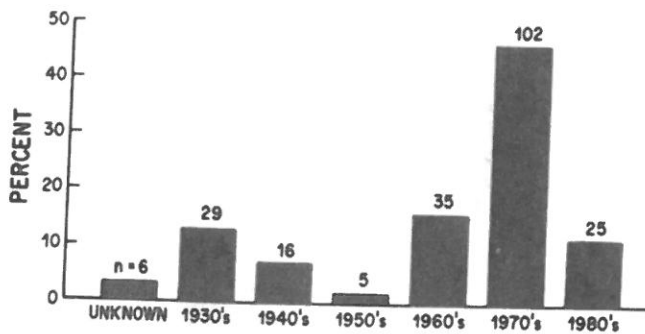


Figure 2.--Periods during which 218 quarter sections of land (former grizzly bear habitat) transferred from crown (government) to private ownership in Ranges 7, 8, and 9 east of Grovedale and south of the Wapiti River. Data include part of 1984.

The Stony Creek lease was issued in 1966 and covered 735 ha in the middle of grizzly bear habitat, an area where no cattle had grazed before 1966. The lease was expanded to cover 1 093 ha in 1970 and remains roughly that size in 1985. The leasee has made application to improve the range, through vegetation modification, and is to fence the area. In 1984 the Alberta Forest Service attempted to cancel the lease by offering three alternate areas outside of grizzly bear range, but the leasee has refused to move. The Forest Service has been forced to relent.

The fate of the wolf (*Canis lupus*) in the lease area can be used to predict the grizzly bear's future. As a consequence of the leasee's depredation problems, real or otherwise, 29 wolves were removed from the lease area between 1974 and 1977. Grizzly bears, too, will kill livestock, whether sheep or cattle (Knight and Judd 1983; Jorgensen 1983). Even though Knight and Judd believe cattle and grizzly bears can coexist "if cattle owners are willing to absorb losses," such tolerance is rare (McCrary and Herrero 1982) and cannot be relied upon.

The two-pronged agricultural threat, first of grazing leases and the subsequent demand for stock protection, and second, the clearing of land and permanent inhabitation of such areas, is a far more serious threat to grizzly bear populations than is the threat of logging or oil and gas exploration. Agricultural development is permanent; people gain control and ownership of the land. They subsequently become protective of their land and property, including stock, and usually want the area biologically sanitized, meaning no bears. This leads to a decline in grizzly bear range and range quality, and then, when private ownership of land is extensive, the disappearance of bears ensues (Elgmork 1976).

#### Logging Activity

In 1969 the Provincial government signed a forest management agreement with Proctor and Gamble Cellulose Ltd. (P&G) that gave the company exclusive rights to all the timber on an area of 15 285 km<sup>2</sup>. This immense area includes the study

area and most of the range of grizzly bears that occupy the study area.

The rights granted to P&G are largely equivalent to those of private ownership. The Alberta Forest Service administers the agreement, with their responsibility being primarily to ensure that P&G removes all timber from the area regardless of the quality of that product. This narrow interpretation forces P&G to harvest areas uneconomical or unattractive to it when such areas could best be used as islands of wildlife habitat.

The forest management agreement in question has no provision for wildlife management input. To incorporate its concerns, the Fish and Wildlife Division can at best hope that P&G and the Forest Service will grant them some concessions. In reality, the Forest Service often acts as a consultant for the company, assisting their interests over those of wildlife and the public.

The management agreement comes up for review every 5 years, and by continually expressing concerns and making inquiries, fish and wildlife biologists at the field level have managed to comment on P&G's timber harvest plans. They have also begun direct negotiations with the company. It has proven impossible, however, to appreciably alter logging activities or forest management area boundaries so as to protect sizable tracts of habitat for grizzly bears and other species.

Although logging has occurred in much of the South Wapiti ecosystem, it has only recently begun to encroach on the study area (fig. 3.); the majority of cuts within the area proper have taken place

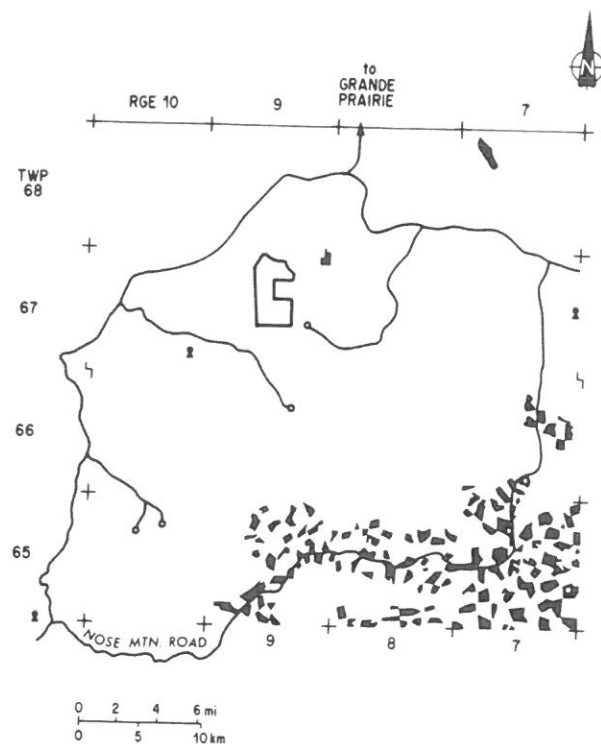


Figure 3.--The location of clearcuts (■) in the South Wapiti area.

since 1983. Four townships that overlap the southeast corner of the study area have had 781, 1 645, 2 185, and 3 629 ha logged, representing 8, 18, 23, and 39 percent respectively, of the area of those townships.

On the positive side, clearcut size declined from the 1970's to the 1980's. The mean size of clearcuts in the 1970's was 59 ha (n= 28), but this has been reduced to a mean of 46 ha (n= 48) in the 1980's ( $p \leq 0.02$ ), a trend that should be encouraged and for which regional biologists and P&G should be congratulated.

As ominous as this extensive clearcutting may seem, there is still less cause for concern about logging than about agriculture. On the basis of my work, the most harmful aspect of clearcutting in the South Wapiti is the provision of access. Excepting main haul roads, the situation is short term, as the roads deteriorate quickly and are allowed to do so. Unlike agriculture, the human presence during logging is short term--the trees are taken, and the area can be abandoned, excluding regeneration activity. Road closures and reclamation would further improve this situation.

It is even possible that, in areas of extensive and dense forest cover, limited and judicious opening of the canopy may prove beneficial to the grizzly bear. Preliminary indications are that such areas will be used by grizzlies if human disturbance is absent (Jonkel 1982; Zager and others 1983). Our data (Horejsi and Hornbeck 1984) indicate likewise--that bears will use clearcuts, in the absence of human activity, particularly when regeneration is high enough to obscure a bear. The question remains unanswered, however, as to how the grizzly bear in the South Wapiti would do in a habitat liberally dissected by clearcuts, versus how it would do in the still largely uncut forest.

If competition exists between black bears and grizzly bears, then the removal of forest cover may confer a competitive advantage on grizzly bears (Jonkel 1985). In the South Wapiti area, where both bears are common, clearcutting in the absence of other influences may tip the odds in favor of the grizzly bear. In such a situation, management emphasis must be placed on the control of access and human activity, including hunting.

#### Oil and Gas Activity

The oil and gas industry is a major contributor to the economy of Alberta. An average of over 5,000 holes per year are drilled in the Province.

Exploration for gas and oil in the South Wapiti began to flourish in 1978 (fig. 4). Drilling required access roads, and during the boom of 1978 through 1981, the yearly pattern of kilometers of road built (fig. 5) mirrored almost exactly the pattern of the number of wells drilled. Grizzly habitat quality, particularly the security aspect of habitat, changed in response. Figure 6 shows the South Wapiti as a relative wilderness in 1969, in stark contrast to figure 7, which shows the

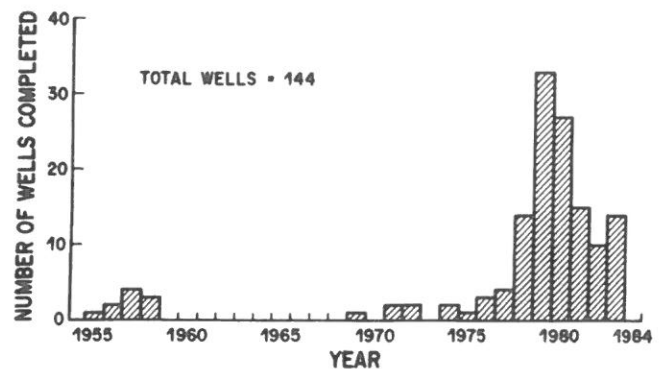


Figure 4.--The number of wells drilled in the study area (Townships 65-68, Ranges 7-11, W6M), 1955 to 1984.

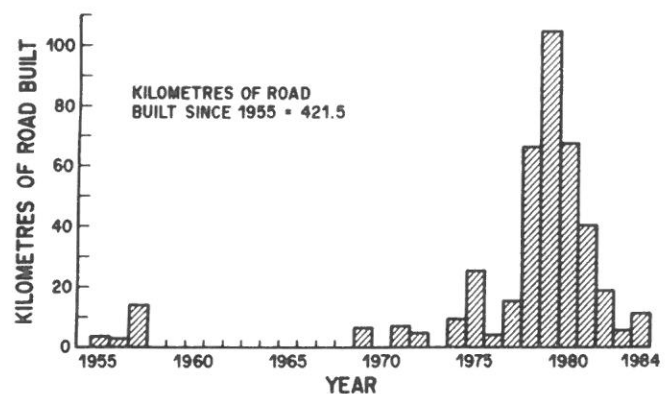


Figure 5.--Kilometers of road built in the course of oil and gas exploration in the South Wapiti (Townships 65-68, Ranges 7-11, W6M), 1955 to 1984.

massive dissection of the area by roads built for resource exploration and extraction.

Few areas escaped the impact of road building and well drilling (table 1). This even distribution of activities came about as a consequence of government policy that provides tax incentives when a gas well is drilled at least 4.8 km away from any existing well. Such policy was designed, with no regard for the wildlife resource, to force exploration companies to expand their zone of exploration, and it has been very successful in achieving that end.

As a consequence of legally defined well-spacing requirements, drilling for gas will have less impact on bears and bear habitat than will drilling for oil. It is technically easier to "drain" a gas field than an oil field; thus gas wells are allowed at a density of one per square mile, whereas oil wells may be permitted at a density as great as 16 per square mile. Such a situation occurs in Township 67 Range 8 (table 1; see also fig. 7), where a shallow oil field is being exploited by Canada's national oil and gas company, Petro Canada.



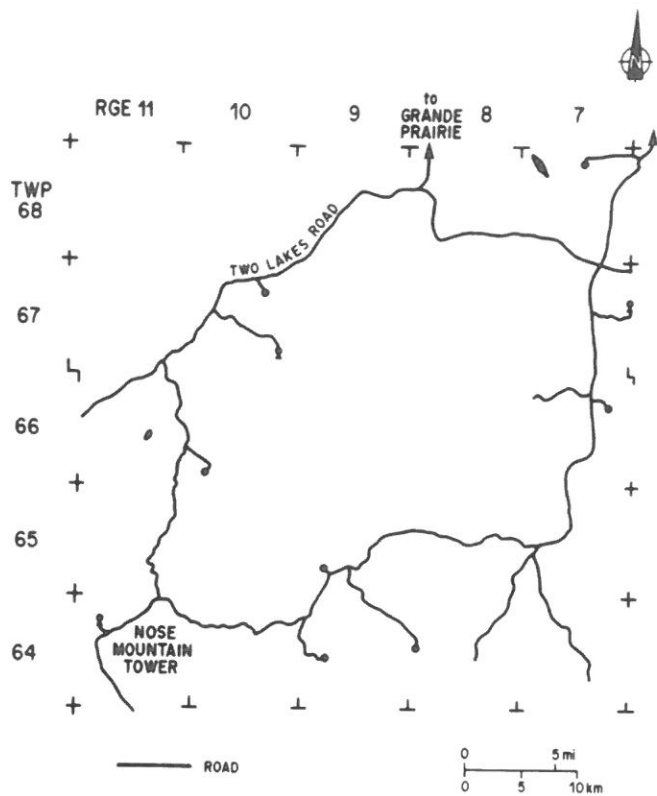


Figure 6.--The South Wapiti area showing roads present at the end of 1969.

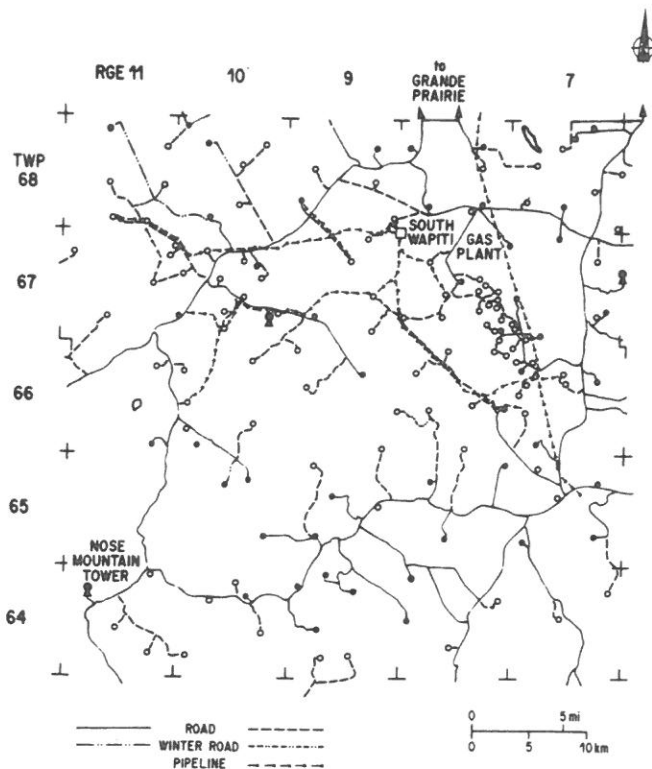


Figure 7.--The South Wapiti area showing roads and pipelines present as of January 1985.

Table 1.--Distribution of wells drilled in the South Wapiti study area (Townships 64-68, Ranges 7-11 W6M) between 1955 and January 1985

Township	Range					Total
	11	10	9	8	7	
68	6	6	5	6	10	33
67	5	10	5	18	9	47
66	2	5	5	8	10	30
65	0	3	4	3	5	15
64	3	4	6	4	2	19
Total	16	28	25	39	36	144

That area has experienced the most intense exploration-development activity in the South Wapiti ecosystem. Petro Canada, whose motto is "for the good of Canadians," has reaped immense benefits from the underground resource but has done nothing to safeguard bear habitat. By their nonparticipation in this grizzly bear study and their refusal of the information generated, they have consciously chosen not to consider the welfare of the grizzly bear population in their drilling and road-building plans.

Drilling activity likely leads to the exclusion of certain bears from certain habitats, the average well in the South Wapiti taking 59 days (n= 144) to drill. The extent of this exclusion, and its impact on a bear, is likely to vary according to the philosophy and actions of the companies involved, the behavior of the people in the field, the intensity of drilling, the nature of the habitat, and the individual bear's behavior.

What we are faced with during the life of a gas or oil field is maintaining a grizzly population at a viable level so that, even if numbers are somewhat reduced, there are enough individuals surviving to permit the population to recover should it become free of the demands of resource development. This is possible if access and hunting are restricted, but the likelihood of such restrictions is the crux of the problem. There is an official unwillingness to control access and hunting. The onus is on government, not industry, to do that. Industry can greatly downgrade road standards to winter road status; well head facilities are increasingly being remotely operated by computer; servicing can be done by helicopter. Such changes in operating procedures can reduce access and impacts on wildlife populations, but the onus is on politicians to require the changes. In this respect, Alberta has been negligent.

#### THE GRIZZLY BEAR POPULATION

This brief discussion of the grizzly bear population in the South Wapiti is restricted to the captured population and available statistics on legal and illegal kills. In 4 years, eight of the 35 bears captured have been killed (fig. 8), and two other bears are unaccounted for.

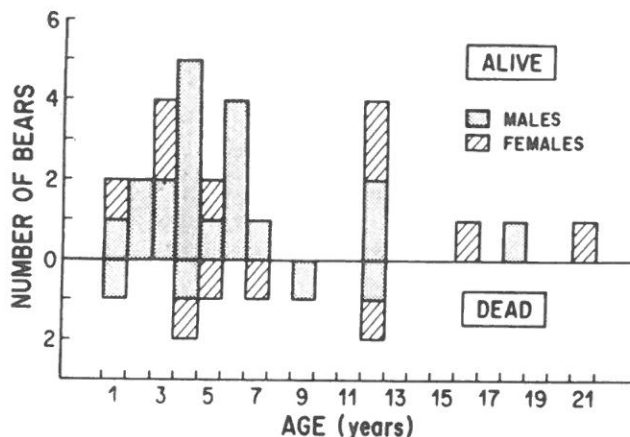


Figure 8.--Age distribution of captured grizzly bears and their young in the South Wapiti area as of November 1984.

At a minimum, this represents an annual mortality rate of 6 percent. More significant is the following: 50 percent of the bears killed were females. Four of the nine females 4 years of age or older have died, an annual mortality rate of 11 percent. The importance of survival among adult females cannot be overstated (Knight and Eberhardt 1984), and it is likely that the high level of mortality among this class of animal in the South Wapiti, if representative of the population at large, exceeds that which would permit the existence of a stable population.

The number of legally registered grizzly bear kills in and around the study area during a recent 6-year period is given in figure 9.

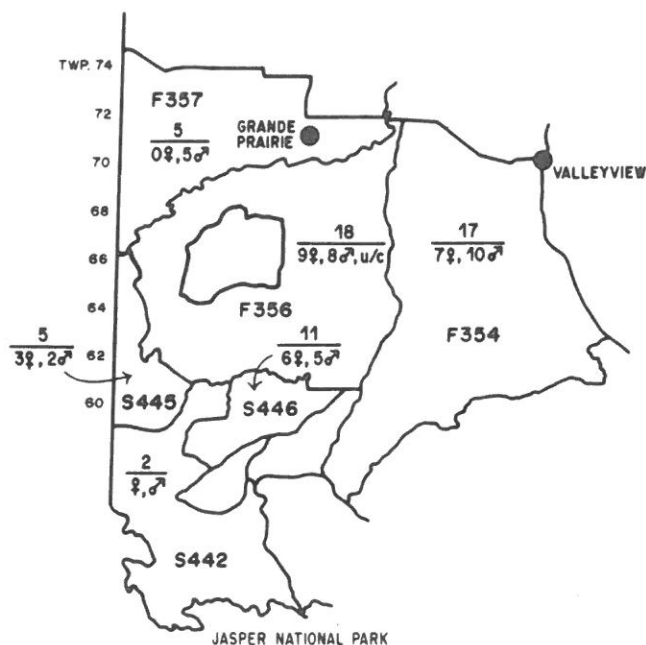


Figure 9.--The number (above line) and sex (below line) of grizzly bears killed in the South Wapiti area, by wildlife management unit (prefix F or S), 1979 to 1984.

Telemetry data (Horejsi and Hornbeck 1984) indicate that the bears caught in the study area range into wildlife management units (WMU's) F357, F356, S445, S442, and S446, as well as adjacent British Columbia. The registered kill of grizzly bears from the South Wapiti populations is 41 animals in 6 years. Nineteen of those bears have been female.

Data from marked animals indicate that three of eight kills (38 percent) were illegal. With this in mind, the legally registered kill can be reexamined. Recognizing that it includes five known illegal kills (three mentioned above, plus at least two others), total human-caused losses can conservatively be estimated at 49 bears (.38 x [41-5]). Illegal kill is, however, likely to be even greater than 38 percent of the legal kill. In addition, the extent of natural mortality is unknown. Total losses to the population, therefore, unquestionably exceed known mortality.

In addition to the effect of improved access on legal and illegal killing of grizzly bears, industrial and agricultural activity creates what could be defined as a deliberate conflict between humans and bears. Among these conflicts, agriculture has the greatest impact on grizzly bears (table 2). In Alberta, it is legal for a landowner or leasee to kill any black bear on land under the individual's control; neither permission nor reporting of kills is required. Given the difficulty understaffed wildlife officers have in responding to complaints, there seems no question that the number of bears reported (table 2) is but a fraction, perhaps one-third to one-half, of those actually removed, all but a few of which are killed.

Table 2.--Number of grizzly and black bears removed from the South Wapiti area (Townships 61-69, Ranges 4-13 W6M) as a consequence of five kinds of human activities, 1977 to 1984. (All removals listed were management actions.<sup>1</sup>)

Year	Activity									
	Agri-culture		Logging		Oil and Gas		Admin./Subdiv.		Recreation <sup>2</sup>	
	B <sup>3</sup>	G	B	G	B	G	B	G	B	G
1977	9		18	1	20		3		5	
1978	4	1	4	1	3				4	
1979	1	1	2		19	1	1		6	
1980	5		6		38		3			
1981	1	3	5		5					
1982			4		3					
1983	9		1				1		2	
1984	1		1		2		1		1	
Total	30	5	41	2	90	1	9	0	18	1

<sup>1</sup>Source: Alberta Fish and Wildlife Division occurrence records.

<sup>2</sup>Management actions associated with recreational facilities.

<sup>3</sup>B = black bear; G = grizzly bear.

<sup>4</sup>Cub sent to zoo.

<sup>5</sup>Female and two cubs relocated 197 km distant.

Has grizzly mortality increased since the increase in accessibility, or are there more bears? The Province of Alberta, in a political analysis of the status of the grizzly, stated that populations declined in the 1960's but have increased since the 1970's (Alberta Energy and Natural Resources 1984c). Unfortunately, no field study of any grizzly bear population on Provincial lands had ever been done before 1974; thus the analysis cannot be substantiated.

The South Wapiti study area is in WMU F356. Access to WMU's F354 and S446 increased dramatically, at the same time and for the same reasons, as it did in F356. In contrast to these areas, F357 is a largely agricultural area with relatively undeveloped perimeters that has seen no significant changes in access for at least 10 years. It is not coincidence that the number of registered grizzly bear kills has about doubled in those management units where access has greatly improved during the last 6 years (fig. 10). Yet the heart of the problem is not simply access but, more precisely, the lack of restrictions on carrying guns and hunting.

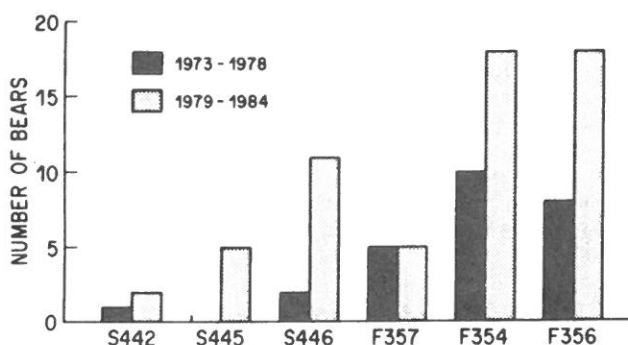


Figure 10.--Number of grizzly bear kills registered during two 6-year periods in Wildlife Management Units in the South Wapiti area.

#### REMOVING THE THREAT TO GRIZZLY BEAR POPULATIONS

Actions that would help conserve grizzly bear populations can be placed in two categories: long-term solutions and immediate or temporary solutions.

Long-term solutions are, in reality, the only solutions. They include:

1. The establishment, on Provincial land, of an extensive wildlife refuge and wilderness preservation system similar to that found in the United States of America.
2. The establishment of administrative areas where oil and gas exploration and timber harvesting continue but the carrying of weapons is severely restricted and hunting is not permitted.
3. A major change in the mandate of the Alberta Forest Service. Their advocacy role on behalf of forest, oil and gas, and grazing industries must be replaced with the recognition that wildlife values equal, or may exceed, those of other resources. Becoming accountable to all

of the people of Alberta will require a massive change of attitude by agency professionals.

4. The development of a political will that recognizes the social, recreational, and ecological values of grizzly bears and thus their need for security and habitat.

Immediate or temporary solutions will extend the life of existing bear populations and will lead to long-term solutions. They include:

1. The development of citizen groups that fervently pursue wildlife conservation through political and public education channels with the assistance of government funding.
2. The cessation of crown land sales.
3. The removal of rights-of-ownership from leased land holders.
4. Government uniformity in the demands made of, and expectations placed upon, industry. Guidelines protecting wildlife and wildlife habitat should be legislated and enforced.
5. A surcharge placed on each exploration and development project on crown land, leases included, amounting to 10 percent of the cost of each program between \$50,000 and \$5,000,000 (scaled back when larger sums are involved). This money would go into a fund for long-term wildlife monitoring and research programs, with major emphasis on the area affected by exploration. Such a fund would be collected and held by a foundation with funds assigned by a review board of industry biologists, consulting biologists, academics, the public, and government biologists.
6. Development of an information and education section in the Fish and Wildlife Division.
7. A major effort to inform individuals who graze cattle on crown land that theirs is a privileged position and that privately owned cattle do not take precedence over publicly owned grizzly bears.
8. Prompt action by the Forest Service, in cooperation with the Fish and Wildlife Division, to completely restrict access in key nonwilderness areas and on all but designated routes in other nonwilderness areas, both during and outside of hunting seasons.
9. Where access for resource extraction is permitted, all but main roads should be kept to winter road standards.
10. Strict regulations and enforcement regarding garbage management should be applied in resource development areas.
11. The elimination of fall grizzly bear hunting in all areas where motorized travel is permitted.
12. Establishment of a kill quota, not to exceed 5 percent of the population, that incorporates legal and illegal kills, whether sport hunting or management related. All grizzly bear hunting licenses should be chosen by draw.
13. The elimination of hunting in at least one out of every three wildlife management units, possibly on a rotating basis.

## SUMMATION

Agriculture, logging, and oil and gas exploration have dramatically changed grizzly bear habitat in the South Wapiti. The impact of agriculture, excepting grazing, can be mitigated only in special cases. The impacts of logging and oil and gas activities manifest themselves primarily through access and subsequent hunting pressure. At this time, government has not compensated for these changes with improved management.

Most resource companies are not knowledgeable about wildlife and therefore may be indifferent, if not opposed, to wildlife conservation measures. There are exceptions among corporations, but our present system does not reward them for their exemplary conduct. Their voluntary help and understanding are important and should be recognized. Implementation of the short-term measures previously itemized will slow grizzly habitat and population losses, and they therefore require prompt action. It is not the responsibility of resource companies to make major decisions regarding the management of wildlife resources, but it is their responsibility to demonstrate wise corporate stewardship of wildlife resources by conducting their operations with the interests of that resource in mind and by providing information about the interaction of that resource with company operations.

On the other hand, it is the responsibility of elected government to maintain grizzly bear populations. The government of Alberta has not fully met this responsibility. The absence of compensating management programs for wildlife in today's resource extraction arenas, where there is almost no control of access and little control of hunting, is evidence of its default. Elected and senior appointed officials in Alberta have demonstrated a low regard for public land and wildlife resources.

## ACKNOWLEDGMENTS

I particularly wish to recognize the very capable assistance of my colleague, Garry E. Hornbeck. I thank Drs. C. Jonkel and P. Zager for their constructive reviews and I wish to thank Canadian Hunter Exploration Ltd., of Calgary, AB, for funding the grizzly bear field work.

## REFERENCES

- Alberta Energy and Natural Resources. A policy for resource management of the eastern slopes. Edmonton, AB. 1977. 19 p.
- Alberta Energy and Natural Resources. A policy for resource management of the eastern slopes revised 1984. Edmonton, AB. ENR No. T/38. 1984a. 20 p.
- Alberta Energy and Natural Resources. Integrated resource plan; Sturgeon Lake-Puskwaskau East sub-regional plan. Edmonton, AB. Tech. Rep. No. T/1, No. 14. 1984b. 139 p.
- Alberta Energy and Natural Resources. Status of the fish and wildlife resource in Alberta. Edmonton, AB. Fish and Wildlife Division. ENR No. 1/87. 1984c. 123 p.
- Aune, Keith; Stiver, Tom; Madel, Mike. Rocky Mountain Front grizzly bear monitoring and investigation. Helena MT: Montana Department Fish, Wildlife and Parks; 1984. 239 p.
- Brown, D. E. The grizzly in the Southwest; documentary of an extinction. Norman, OK: University of Oklahoma Press; 1985. 274 p. + appendices.
- Cheek, R. Bears don't always look the same. Tobacco Valley News, Eureka, MT. 1983 September 8.
- Edwards, Mike. Battle for a bigger Bob. National Geographic. 167(5): 690-692; 1985.
- Elgmork, Kare. A remnant brown bear population in southern Norway and problems of its conservation. International Conference on Bear Research and Management. 3: 281-297; 1976.
- Horejshi, Brian; Hornbeck, Garry. South Wapiti Grizzly bear study. Unpublished data, on file at: Western Wildlife Environments Consulting Ltd., Calgary, AB. 1984.
- Jonkel, Charles. The border grizzly. Western Wildlands. 8(1); 32-36; 1982.
- Jonkel, Charles. Personal communication. 1985 April 3. Missoula, MT.
- Jorgensen, Carole. Bear-sheep interactions, Targhee National Forest. International Conference on Bear Research and Management. 5: 191-200; 1983.
- Knight, Richard; Judd, Steven. Grizzly bears that kill livestock. International Conference on Bear Research and Management. 5: 186-190; 1983.
- Knight, Richard; Eberhardt, L. L. Projected future abundance of the Yellowstone grizzly bear. Journal of Wildlife Management. 48(4): 1434-1438; 1984.
- McCrory, Wayne; Herrero, Steve. A review of historical status of the Grizzly bear in Kananaskis Country, Alberta. BIOS Environmental Research and Planning Associates Ltd. for Alberta Fish and Wildlife Division, Calgary, AB. 1982. 123 p.
- South Peace Regional Planning Commission. Grovedale Area Planning Study. Grande Prairie, AB. 1984. 84 p.
- Turbak, G. Lord of the mountain. Equinox. 18: 63-67; 1984.
- Zager, Peter; Jonkel, Charles; Habeck, James. Logging and wildlife influence on grizzly bear habitat in northwestern Montana. International Conference on Bear Research and Management. 2: 124-132; 1983.