

USING GRIZZLY BEAR HABITAT EVALUATIONS TO LOCATE TRAILS AND CAMPSITES IN KANANASKIS PROVINCIAL PARK

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Abstract: Kananaskis Provincial Park (504 km²) is part of a large outdoor recreation area, Kananaskis Country (approximately 5,200 km²), near the city of Calgary (population 600,000). Kananaskis Country is undergoing major development for outdoor recreation. Recently, approximately \$225 million have been spent on roading, trails, and facility construction. The alpine ski events of the 1988 Winter Olympics will be held within the area. Grizzly bears (*Ursus arctos*) historically ranged throughout Kananaskis Country. Today they are found in about 75% of the area. To maintain grizzly bears and to provide for human safety, a transect method of rating grizzly bear habitat use and potential for use was developed and applied. Four examples are given where information collected in Kananaskis Provincial Park influenced locations of trails or campsites. The transect method is a rapid method of habitat evaluation but is subject to several limitations, which are discussed.

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Grizzly bear attacks most often occur when people suddenly confront a bear while hiking (Herrero 1970, 1976, 1985; Martinka 1971). However, the majority of sudden confrontations between grizzly bears and people do not lead to injury (Herrero 1970, 1985; R. Knight, unpubl. data). Because some encounters do lead to injuries, however, decreasing the chances of sudden confrontation is an important management concern.

Certain trail characteristics, such as whether a trail passes through grizzly bear habitat, the time of year used, the extent of visibility along a trail, and the proximity of a trail to noisy streams or dense cover, influence the chances of a sudden encounter with a grizzly bear. Hiker behavior and the experience of grizzly bears with people are other important variables (Herrero 1970, 1976, 1985; McArthur Jope 1982). Other things being equal, the number of human injuries inflicted by grizzly bears increases with the amount of human use of a given area (C. Martinka, unpubl. data).

The other major situation associated with human injury inflicted by grizzly bears is when the attacking bear has a history of feeding on human foods or garbage and as a result has become willing to seek out these foods when people are nearby. Grizzly bears seeking human foods or garbage are usually tolerant of people. Occasionally, however, grizzly bears foraging in these circumstances may tear into a tent and injure someone, may suddenly confront someone and injure him or her, or—in the worst situations—may treat people as prey (Herrero 1976, 1985).

The likelihood of grizzly bears and people interacting around campgrounds or campsites is related to how well food and garbage are stored and to whether grizzly bears naturally use areas near to

camp. Although it is true that grizzly bears travel long distances to get to garbage dumps, it is also true that if a camp is in the middle of important bear habitat, the chance of attracting and interacting with grizzly bears increases. In Yellowstone National Park, Fishing Bridge campground is in important grizzly bear habitat; the Park General Management Plan and its Environmental Impact Statement call for closure of the campground because of conflict with bears. In Banff National Park, Lake Louise campground has had a long history of grizzly bear problems (Herrero 1976). This campground is adjacent to high-quality grizzly bear habitat.

An important way to decrease the chances of interactions between people and grizzly bears is by locating trails and camping areas away from important grizzly bear habitat. Grizzly bears use their environment for at least the following functions: feeding, resting and retreat, traveling, denning, and mating. Studies too numerous to cite have identified the habitat types used for at least some of these functions in areas where grizzly bears are found. The greatest likelihood of people interacting with a grizzly bear occurs at feeding, resting and retreat areas, or when grizzly bears are traveling between these areas. Many denning and mating areas are not particularly hazardous, mainly because of their locations and the time of year in which they are used (Herrero and Hamer 1977, Vroom et al. 1980). Time budget studies of grizzly bear activities show that grizzly bears spend most of their time feeding and resting (Stelmock 1981; H. Reynolds, unpubl. data). Resting areas are normally near feeding areas; therefore grizzly bears are usually near feeding areas.

To plan for human activities in areas where grizzly bears are found, it is important to first decide whether

it is desirable to maintain the population of grizzly bears. If the answer is yes, steps may be taken to minimize the chances of grizzly bears injuring people and of people killing grizzly bears. In this paper we present a system for rapid field evaluation of grizzly bear habitat. We emphasize identification of actual and potential feeding areas and the limitations of the method. Using habitat data, we show how some trails and camping areas were planned, designed, and located in relation to grizzly bear habitat in Kananaskis Provincial Park, Alberta.

STUDY AREA

The study area, Kananaskis Provincial Park (504 km²) in southwestern Alberta, is part of a large (approximately 5,200 km²) recreational area known as Kananaskis Country (Fig. 1). The Park is just east of the Great Divide of the Rocky Mountains. Kananaskis Park is a series of deep mountain valleys with rugged peaks as high as 3,000 m. It is drained principally by the Kananaskis River. Two large lakes, Upper and Lower Kananaskis lakes, are located in the core of the Park. These lakes are now reservoirs for hydroelectric power. Most of the valley bottoms and mountain slopes are characterized by lodgepole pine (*Pinus contorta*), with some areas of mature spruce (*Picea glauca*, *P. engelmannii*) and subalpine fir (*Abies lasiocarpa*). Some old-growth forest was clear-cut in the early 1970s. Extensive open grasslands are found along some of the valley walls, which are winter range for Rocky Mountain bighorn sheep (*Ovis canadensis*) and American elk (*Cervus canadensis*). Much of the high country is characterized by high rock peaks, with little vegetation except for scattered areas of alpine vegetation. The bedrock includes a wide range of sedimentary geological materials. Some of the existing soils, such as those with shale content, favor the growth of yellow hedysarum (*Hedysarum sulphurescens*) and seem to facilitate digging for the roots of this plant by grizzly bears (Holtcroft and Herrero 1985). Periodic warm winds, chinooks, blow from the west throughout the year. These winds decrease snow cover and thus help make southwest exposed slopes available for root digging by grizzly bears relatively early in spring.

For most of the period 1902–30, the area now incorporated into Kananaskis Park was part of Rocky Mountain National Park (now Banff National Park). From 1930 to 1956, it was part of the Kananaskis Game Preserve and was hunted only by the Stoney

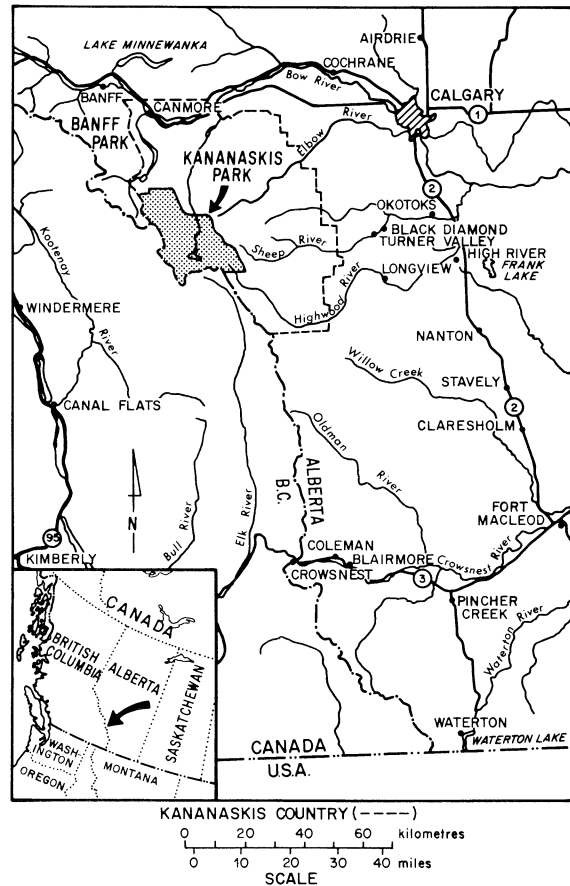


Fig. 1. Kananaskis Country and adjacent areas, showing location of study area and proximity to Calgary.

Indians, who apparently did not hunt grizzly bears. After 1956 the hunting season was opened, which allowed trophy hunting for grizzly bears. This, plus improved access by road and bear-killing by nearby ranchers provoked by actual or potential livestock depredation, apparently diminished the grizzly bear population and reduced their distribution (W. McCrory and S. Herrero, unpubl. rep., Alberta Fish and Wildl. Division 1982). In 1970, the grizzly bear season was closed. Historically, there have been few human-bear conflicts in the area covered by Kananaskis Park. There were 2 mauulings before 1900 according to the Stoney Indians (W. McCrory and S. Herrero, unpubl. rep., Alberta Fish and Wildl. Division 1982).

Kananaskis Park was established in 1977 to serve primarily as a wilderness core for the larger Kananaskis Country Recreation Area. The Province of Alberta has spent an estimated \$225 million to de-

velop access and facilities within the recreation area. Much of the Park and recreation area are within a 2-hour drive of Calgary, a city of 600,000. When completely developed, Kananaskis Country will consist of such recreational facilities as a 36-hole championship golf course, alpine villages providing overnight accommodation, more than 3,000 auto campsites, and about 1,000 km of trails for hikers, horse riders, cyclists, cross-country skiers, and snowmobilers. In addition, facilities are now being built for all the alpine events for the 1988 Winter Olympics.

METHODS

Our experience in Kananaskis Park suggested significant ecological similarities between this study area and the Cascade and Panther river valleys of Banff National Park, where Hamer and Herrero (unpubl. rep., Parks Canada, Calgary 1983) had previously spent 5 years studying grizzly bear habitat relationships and food habits. The Banff Park project employed radiotelemetry. Hamer and Herrero had also begun to develop a transect method for evaluating grizzly bear habitat in areas of Banff Park that were ecologically similar to their study area. In Kananaskis Park, we further refined their transect method and added some new food items to our evaluation.

The transect method of rating actual and potential habitat use is qualitative but based on field sign and known grizzly bear habitat use and diet. Transects were routes walked along game or hikers' trails or through pathless areas. We usually laid out transects to roughly sample the assumed bear habitat in an area and determined this assumed bear habitat by visually inspecting the area and by examining topographic maps or air photos. Where a trail or campground was proposed, we also laid out transects to cover these areas. We divided each transect into a number of segments, which began and ended where there was a distinct vegetative or topographic feature or change. We assigned each transect a number and marked the transect route and segments on 1:50,000 topographic maps.

To estimate habitat use along each transect segment, we noted signs of feeding such as the number and extent of root or ground squirrel diggings, broken branches and berries knocked to the ground from fruit-bearing shrubs, and croppings of vegetative foods (if associated field sign suggested these were made by grizzly bears). In addition to sign of feeding, we noted and collected scats and recorded the fre-

quency and location of tracks, mark trees, and bear trails. We estimated age of sign when possible.

We rated habitat potential in addition to habitat use because we were not able to systematically study habitat use over a period of years and human factors such as developments, hunting, and hiking can influence whether available habitat is used. Habitat potential ratings were based on subjective estimates of the relative abundance (high, medium, low, trace, absent) of 24 known grizzly bear plant foods (Fig. 2) along each transect segment. Known animal foods were similarly rated.

We then subjectively summarized information, 1st by combining the habitat use and potential information for the various segments that made up a transect and then by combining the various transects done in a given area (usually a drainage basin). Because the information was imprecise, we combined it subjectively. We based habitat potential for a transect on the segment ratings given various plant and animal foods used by grizzly bears and on our knowledge of the importance of each food as based on detailed diet and habitat study done in the nearby and ecologically similar Banff National Park (D. Hamer and S. Herrero, unpubl. rep., Parks Canada, Calgary 1983). A narrative summary discussing habitat use and potential in an area was the result. The summaries were neither precise nor quantitative. They formed a broad picture of assumed grizzly bear habitat use and potential and most often related the variables to drainages or areas proposed for campgrounds. The summaries compromised biological rigor for breadth. They were designed to be useful to land managers and planners.

EVALUATION EXAMPLES

To illustrate our work we present the results of applying the transect method to 4 areas in Kananaskis Park. We chose these 4 cases because in each the results influenced trail or campsite development (W. McCrory and S. Herrero, unpubl. rep., Alberta Fish and Wildl. Division 1982).

Burstall Valley

The highly scenic Burstall wilderness valley provides an access route to Banff Park over an old trail. During 1981 field surveys, we identified the lower to middle sections of this valley (1,920–2,070 m elevation) as having significant habitat potential for grizzly bears. Areas of lush horsetail (*Equisetum* spp.) and

KANANASKIS COUNTRY GRIZZLY PROJECT

HABITAT EVALUATION

Location:

Transect #:

Date:

Observer:

		SPECIES	TRANSECT SEGMENT					
			1	2	3	4	5	6
ROOTS and CORMS	GLACIER LILY (<i>Erythronium grandiflorum</i>)							
	SPRING BEAUTY (<i>Claytonia lanceolata</i>)							
	YELLOW HEDYSARUM (<i>Hedysarum sulphurescens</i>)							
	PINK HEDYSARUM (<i>Hedysarum alpinum</i>)							
	NORTHERN HEDYSARUM (<i>Hedysarum boreale</i>)							
	HEDYSARUM SPECIES (<i>Hedysarum spp.</i>)							
GREEN VEG.	HORSETAIL (<i>Equisetum arvense</i>)							
	HAIRGRASS (<i>Deschampsia caespitosa</i>)							
	COW PARSNIP (<i>Heracleum lanatum</i>)							
	MOUNTAIN SORREL (<i>Oxyria digyna</i>)							
	VETCH (<i>Lathyrus spp., Vicia spp.</i>)							
BERRIES	CROWBERRY (<i>Empetrum nigrum</i>)							
	BEARBERRY (<i>Arctostaphylos Uva-Ursi</i>)							
	BLACK CURRANT (<i>Ribes lacustre</i>)							
	CURRANT SPECIES (<i>Ribes spp.</i>)							
	GROUSEBERRY (<i>Vaccinium scoparium</i>)							
	LOW BLUEBERRY (<i>Vaccinium myrtillus</i>)							
	HYBRID BLUEBERRY (<i>Vaccinium scop./myrt.</i>)							
	BLUEBERRY SPECIES (<i>Vaccinium spp.</i>)							
	BUFFALOBERRY (<i>Shepherdia canadensis</i>)							
	ELDERBERRY (<i>Sambucus spp</i>)							
	BRACTED HONEYSUCKLE (<i>Lonicera involucrata</i>)							
	RASPBERRY (<i>Rubus strigosus</i>)							
ANIMALS	ANTS							
	UNGULATES							
	OTHER							

One letter indicates a rating for the density of a plant species.

Two letters separated by a "/" indicates plant density and fruit production.

For example: M/L indicates medium plant density and low fruit production.

Ratings: H=high ; L low ; Tr=trace ; M=medium .

Fig. 2. Field data transect form showing foods known to be eaten by grizzly bears in Kananaskis Country, Alberta.

hairgrass (*Deschampsia* spp.) were found along the edges of the stream flats and lakeshores; numerous slide areas had varied combinations of glacier lilies (*Erythronium grandiflorum*), cow parsnip (*Hera-
cleum lanatum*), and yellow hedsysarum. In 1981 the most intensive use of these vegetative associations in Burstall Valley took place in July and August. An evaluation of signs (croppings, scats, tracks) indicated that bears were feeding on green vegetation along creek flats, as well as concentrating on cow parsnip and glacier lily corms on the avalanche fans. One of the main avalanche fans in the middle valley showed intensive use from mid-July to mid-August.

We were concerned about a proposed group campsite 100 m below the main avalanche fan in the mid-valley, where a previous campsite had existed. This camp had been used on a small scale in the 1970s for an outdoor training program by a commercial enterprise. The main Burstall trail ascended from this camp and passed up a small ravine (with a creek) at the base of the main avalanche fan, which grizzly bears used intensively in summer. Not only did the trail pass along the lower limits of glacier lily diggings, but there were 2 sharp turns and the noise of a stream rushing by. Together, these factors created a high hazard for a close encounter with a grizzly bear, particularly as the peak of grizzly bear use of this site coincided with the summer peak of visitor use.

Consequently we recommended that no group camp or other overnight facilities be built in the lower-middle areas of the Burstall Valley and that the trail be rerouted to avoid some horsetail patches along the lower reaches and main avalanche fan above the historical camping spot. In 1982, the trail was upgraded, incorporating our recommendations. The Burstall trail was rerouted along a mountain slope to bypass the main slide area used by grizzly bears in the summer. Approximately 800 m of trail were rerouted at a cost of about \$9,000.

French Creek

French Creek is a sister valley to Burstall but has no designated access other than a logging road at 1 end. It, too, is a mosaic of alpine meadows, subalpine mature forest, avalanche paths, and numerous moist seepages and streamsides in the main valley bottom. Eight kilometers long, its remote wilderness and rugged headwall peaks and glacier make it attractive for recreational use. Planners proposed making a trail

up this valley to a low col; this would create a circuit route over the Robertson Glacier and out the Burstall Valley.

During the summer of 1981, we found lush patches of herbaceous bear food items throughout much of the valley bottom and along the proposed trail corridor. Scats, tracks, and feeding sign indicated moderate summer use concentrated along the proposed trail corridor. We could not distinguish grizzly bear from black bear sign. In French Creek, the proposed trail route would have created many blind spots where a surprise encounter could occur, for example, at numerous side ravines or along the main creek with its numerous bends and noise. We concluded that this trail would create a high potential for human-bear encounters. We then examined the opposite side of the valley as a possible alternative for the trail but again found good areas of green vegetation with bear use, including several digging sites for glacier lily corms on avalanche path fans.

Because of the high summer habitat potential for grizzly bears in this valley, at least moderate known use, and lack of safe alternative trail routes, we recommended having no trail in this valley. Kananaskis Country planners cancelled plans for the French Creek trail.

Chester Lake Area

The Chester Lake area is a plateaulike subalpine hanging valley opposite the Burstall Valley. Access is by a logging road up the main valley slopes and then along an old trail for 3–4 km to Chester Lake. The upper valley is attractive mainly because of its wilderness features, scenery, ease of access, and fishing. Boy Scout leaders also take a wilderness training program in this area during the summer months.

Evaluation of this semiforested valley showed a scattered mosaic of green vegetation bear foods along some of the streams and also along seepages on the valley walls. Little summer feeding by grizzly bears was evident. The main use seemed to be spring and fall digging for hedsysarum roots on several sites along the valley walls and, secondarily, some minor spring or summer consumption of glacier lily corms and cow parsnip. However, the micro-habitats used by grizzly bears in this valley were scattered over a broad area. The trail route passed along the valley bottom through open willow (*Salix* spp.) meadows or subalpine forest with generally good visibility and low densities of bear foods. For these reasons we consid-

ered the trail relatively safe from human-bear encounters. One or 2 grizzly bears have been reported in this valley every year or so; because of this and the overall moderate habitat capability, we recommended not constructing overnight campgrounds there.

In 1982 the trail was improved, and some corners were cleared to provide better line of sight. Only primitive overnight camping is planned for the area with no established facilities.

Mount Indefatigable Trail

The Mount Indefatigable Trail was already under construction in the early summer of 1981, when field work on grizzly bear habitat commenced. The trail is on a dry semiwooded mountain slope on the north side of Upper Kananaskis Lake in an area that is popular with the public. Two hikers' routes were unofficially established up these mountain slopes; part of the rationale for the new trail was to establish a trail with 1 main route and to create a day hike area for families.

The proposed route was to ascend through lodgepole pine woods on the lower mountain slopes, starting at 1,740 m, and then ascend along a ravine with a small creek for about 1 km before cutting back to a long ridge above a large cliff that overlooks Lower Kananaskis Lake. During field investigations, we found this ravine was the only significant area of moist summer vegetation on this south-facing slope. The narrow ravine had moderate densities of cow parsnip and horsetail, which could attract a grizzly bear during the summer months when hiker traffic would be highest. Along this ravine we found about 40 spring diggings for *hedysarum*.

We concluded that it would be inadvisable to put the planned trail up this ravine. Not only is there suitable summer vegetation for bears to feed on, but there is a blind spot, where the trail would descend to the ravine, and blind corners part way up the ravine, where bears had fed on *hedysarum* roots. The noise of the creek would increase the likelihood of a close encounter if a bear were feeding there.

An alternative route was located on the ridge about 100 m east of the ravine. Although this route entailed more expense, as the rerouted trail involved some construction on bedrock (and switchbacked to overlook the ravine in 1 spot), it was believed to be safer. Some hazard still exists, however. The lower trail was forced to pass a grizzly rub tree, and in the fall of

1981 a grizzly bear track and scat along the upper trail indicated that a bear had been feeding in the patches of blueberry (*Vaccinium* spp.)

DISCUSSION

Grizzly bear habitat analysis has been conducted for many reasons and with many different techniques (see, for example, Mealey et al. 1977; R. Knight et al., unpubl. rep., U.S. Dep. Int. 1981; Servheen 1981; Stelmock 1981; Craighead et al. 1982; D. Hamer and S. Herrero, unpubl. rep., Parks Canada, Calgary 1983). Ours is, however, the first published study using habitat analysis to plan trails and campsites. Our examples show how habitat analysis data influenced such planning in a large recreation-oriented provincial park.

The limitations of our work were considerable. Constraints of time and money prohibited us from employing radiotelemetry or from being able to work in a given area for more than 1 season. Our experience using radiotelemetry to determine habitat relationships of grizzly bears in an ecologically similar area (Banff Park) suggests that we probably missed some important feeding microenvironments in Kananaskis Park because our transects did not pass through them; however, we believe our habitat transects provided a reasonable 1st approximation of habitat use and potential. To achieve this approximation, people with at least several years' experience in evaluating grizzly bear habitat use and potential performed the work in Kananaskis Park. In addition, we studied the history of grizzly bear activity in this area by reviewing explorers' journals and other documents and by interviewing guides, park rangers, Stoney Indians and others (W. McCrory and S. Herrero, unpubl. rep., Alberta Fish and Wildl. Division 1982). This review provided backup information for assessing trail and campground proposals.

Another limitation of our work was the use of subjective ratings of the vegetation density and bear use of food items. We also determined overall habitat potential and use by subjectively interpreting the ratings for specific plant and animal foods and other habitat components.

Such an approach might have had limited validity were it not based on detailed knowledge of grizzly bear habitat relationships in a nearby and ecologically similar region. We suggest that the transect method as applied in our study at least crudely evaluated grizzly bear habitat use and potential.

Although the transect method is subject to significant potential error, its speed and cost make it useful. Concurrent with our work, a study of grizzly bears employing radiotelemetry was going on in a nearby portion of Kananaskis Country (and to a limited extent in Kananaskis Park). Although a primary objective of this work was to identify areas of high grizzly bear activity, information could not be provided in time to influence the locations of trails and campgrounds in Kananaskis Park. Also, the high densities of park visitors prohibited intensive trapping and radio-collaring of grizzly bears in the Park.

We recommend the transect method only when radiotelemetry is not possible because of time constraints, finances, or logistics. An essential prerequisite to using the transect method is previous study using telemetry of grizzly bear habitat in an ecologically similar region. The transect method does add some new information about habitat use and potential and might be employed in combination with a remote sensing habitat evaluation system such as that developed by Craighead et al. (1982). In our opinion transects are an important complement to remote sensing habitat evaluation because of the importance of microhabitats such as small but dense patches of horsetails occurring alongside streams. These and other important feeding areas were too small to be recognized at an aerial photo scale of 1:10,000 (false color infrared) in portions of Banff National Park that are ecologically similar to our study area.

After trail and campsite plans have been formalized in response to habitat evaluations, but before construction begins, we recommend doing more detailed habitat analysis in and adjacent to areas identified for development. At this point the bear habitat analysis team should work directly with park planners to best determine the specific location of trail segments and lines of sight along segments.

We are not suggesting that trails can be built and

used in grizzly bear habitat without having an impact on the bears or without exposing people to some danger of attack by a grizzly bear. We have proposed a means to help keep most people away from important bear habitat, thus reducing harassment of this dangerous but vulnerable species while enhancing human safety.

LITERATURE CITED

- CRAIGHEAD, J. J., J. S. SUMNER, AND G. B. SKAGGS. 1982. A definitive system for analysis of grizzly bear habitat and other resources. Wildlife-Wildlands Instit. Mongr. 1. Missoula, Mont.
- HERRERO, S. 1970. Human injury inflicted by grizzly bears. *Science* 170:593-598.
- . 1976. Conflicts between man and grizzly bears in the national parks of North America. *Int. Conf. Bear Res. and Manage.* 3:121-145.
- . 1985. Bear attacks: their causes and avoidance. Winchester Press, Piscataway, New Jersey. 287pp.
- , AND D. HAMER. 1977. Courtship and copulation of a pair of grizzly bears—with comments on reproductive plasticity and strategy. *J. Mammal.* 58:441-444.
- HOLCROFT, A. C., AND S. HERRERO. 1985. Grizzly bear digging sites for *Hedysarum sulphurescens* roots in Southwestern Alberta. *Can. J. Zool.* 62:2571-2575.
- MARTINKA, C. J. 1971. Status and management of grizzly bears in Glacier National Park, Montana. *Trans. North Am. Wildl. and Nat. Resour. Conf.* 36:313-320.
- MCCARTHY JOPE, K. 1982. Interactions between grizzly bears and hikers in Glacier National Park, Montana. M.S. Thesis, Oregon State Univ., Corvallis. 100pp.
- MEALEY, S. P., C. J. JONKEL, AND R. DEMARCHI. 1977. Habitat criteria for grizzly bear management. *Int. Cong. Game Biol.* 13:276-288.
- SERVHEEN, C. 1981. Grizzly bear ecology and management in the Mission Mountains, Montana. Ph.D. Thesis, Univ. Mont., Missoula. 138pp.
- STELMOCK, J. S. 1981. Seasonal activities and habitat use patterns of brown bears in Denali National Park—1980. M.S. Thesis, Univ. Alaska-Fairbanks. 118pp.
- VROOM, G. W., S. HERRERO, AND R. T. OGILVIE. 1980. The ecology of winter den sites of grizzly bears in Banff National Park, Alberta. *Int. Conf. Bear Res. and Manage.* 4:321-330.