# BANFF NATIONAL PARK: SCIENCE AND POLICY IN GRIZZLY BEAR MANAGEMENT

STEPHEN HERRERO, Environmental Science Program, Faculty of Environmental Design, University of Calgary, Calgary, Alberta, Canada, T2N 1N4. Email: herrero@evds.ucalgary.ca

JILLIAN ROULET, Parks Canada, Banff National Park, Box 900, Banff, Alberta, Canada, TOL OCO.

MIKE GIBEAU, Resources and Environment Program, University of Calgary, Calgary, Alberta, Canada, T2N 1N4.

***Abstract:*** Grizzly bears in Banff National Park and the surrounding ecosystem exist in one of the most developed and politically complex environments where the species persists. People's developments and activities have significantly stressed the grizzlies population and habitat. The Canadian National Parks Act was amended in 1988 and was changed to stress the maintenance of ecological integrity. When a federal task force (Banff-Bow Valley Study) was established in 1994 the status of grizzly bears was seen by many as a fundamental indicator of terrestrial ecological integrity. Also in 1994 the Eastern Slopes Grizzly Bear Project (ESGBP) was formed as a multi-stakeholder partnership between four societal segments: governments, business, conservation groups and a university. The primary mandate was to scientifically define the cumulative effects of development on the regional grizzly bear population. A Project Steering Committee meets four times a year and sets research policy. The Steering Committee used strategic targeting and a knowledge of the policy formation process to design our input into the Banff-Bow Valley planning process. Strategic targeting led us to analyze our preliminary data regarding four primary research components: mortality, habitat effectiveness, security and habitat quality, and landscape linkages. Our data on these topics significantly influenced policy decisions because: 1) we took a multi-stakeholder and interagency approach to research, 2) we established a solid public understanding of the issue before discussion of solutions, 3) we provided the messages as experts outside of government, 4) key decision makers were directly involved in developing the park management plan, and they understood our concerns and were able to contribute solutions, 5) we were able to provide specific targets and goals in a way that could be incorporated into policy, and 6) we were persistent and timely in presenting our results (goals and targets) and their implications.

***Int. Conf. Bear Res. and Manage. 11:000-000***

***Key words:*** Banff National Park, bear, decision making, grizzly bear, management, planning, policy, politics, prototype, research, science, *Ursus arctos*

Scientific knowledge regarding grizzly bears is fundamental for management and conservation. Conservation oriented scientists often wish that what they believe are the implications of their research would be translated into policy changes and management actions. However, successful grizzly bear management and conservation, while grounded in science, is basically a problem solving art requiring a broad base of public and political support (Peyton et al. 1998). Science, values and politics interact to form public policies regarding the management and conservation of bears (Kellert 1994). To think that science alone will result in desired objectives in public policy would be naive and may be counterproductive. An effective, goal-oriented approach, is based on awareness and integration of science, public values, politics and socioeconomic factors. These are used to inform policy alternatives and to attain goals (Franklin 1995). Kellert (1994) cogently argues that the wildlife policy process is multidimensional, interactive, and dynamic and therefore is extremely complex and subtle. "The recognition and understanding of bear policy as a complex web of interacting scientific, valuational, and political forces can enhance the chances for developing more successful policies, as well as increase the opportunities for greater professional effectiveness and a sense of control over the policy process" (Kellert 1994).

Decision making processes within land management agencies respond to many forces and do not adapt quickly to change or new information. Existing policies therefore have inertia because often they have evolved to balance many different forces. Given the resistance to change and the complex nature of policy decisions, scientists interested in influencing wildlife policy need to understand decision process and to think strategically (Clark and Brunner 1996, Servheen 1998). However, "scientific research often does not focus on policy-relevant issues (Ascher 1993, as cited in Clark 1994), and it may not be presented in terms that are useful or even understandable to decision makers (Clark 1994)".

To increase chances of achieving desired future conditions, the fundamental of planning, Servheen (1998) recommends a strategic planning approach. Identifying and prioritizing threats is fundamental, as is developing means to address them (Servheen 1998, Peyton et al. 1998). Threats have potential to affect major factors important for population survival---such as mortality, survivorship, natality, habitat, linkages, monitoring, and public and political support, or the lack thereof. Servheen (1998) recommends using strategic targeting to identify, prioritize and act on perceived treats. The mandate to do these things must come from relevant policy.

Clark (1994) cautions that "shared knowledge cannot obviate the conflicts that arise from inherent differences in values and perspectives," and that prediction is not always possible in a rational/scientific sense because all variables and their interactions are seldom understood. Given these limitations, Brunner and Clark (1997) recommend a practice-based approach in ecosystem (grizzly bear) management. Here change is initiated at a relatively small scale through prototyping. A prototype is a trial change, a sort of controlled experiment, in a system. If successful, then this can be propagated (Brunner and Clark 1997).

Our paper examines the development of one such prototype, a new management policy regarding grizzly bears in Banff National Park, Canada (Parks Canada 1997). This new and significantly different policy was influenced partly by research results and management recommendations made by a major, multi-stakeholder research effort, The Eastern Slopes Grizzly Bear Project (ESGBP).

The ESGBP began in 1994 as a partnership between four major societal sectors: businesses, conservation groups, governments, and academia. Representatives from these sectors sit on a Project Steering Committee which sets policy regarding research and keeps supporters informed of results (Herrero et al. 1998). Since project inception a $350,000 Canadian, per year, budget has supported a major research effort with the primary objective of understanding the cumulative effects of development on the grizzly bear population and habitat found in and around Banff National Park. Because of wide-ranging movements, especially of males, many grizzly bears enter numerous land jurisdictions during a given year. They exist in one of the most developed landscapes in North America where grizzly bears survive. Banff National Park is the most developed national park in North America but it still provides protection and habitat for a geographically shared grizzly bear population estimated to be from 60 to 80 individuals.

The Canadian Federal Government, responding to concerns about the affects of development on the ecological integrity of the Park, established a 2 million dollar Task Force in 1994 (Banff-Bow Valley Study) with a mandate to report by 1996 regarding the state of the Park and to provide recommendations for the future. The minister of Canadian Heritage, Ms. Shelia Copps, committed the Federal Government to revising the Banff National Park Management Plan within 6 months of receiving the report to reflect the findings of the Task Force. The status of large carnivores, especially grizzly bears and wolves, was identified by the Task Force as a key indicator of ecological integrity. The ESGBP was asked to prepare a detailed report on the status of the grizzly bear population and habitat; at the time the report was prepared our research results regarding grizzly bears were preliminary; we had completed 2 years of a 5 year research project. This paper examines the nature of our data, conclusions and recommendations, and the means by which they interacted with other policy issues and influenced policy decisions made in re-writing the Banff National Park Management Plan. We test the assumption (hypothesis) that research data influence policy. We describe the interaction between scientific data, other societal forces, and new management actions related to grizzly bears as evidenced by changes in policy.

## RESEARCH COMPONENTS

The Banff-Bow Valley Task Force asked the ESGBP to prepare a report on the status of the grizzly bear population and habitat, focusing on the Banff-Bow Valley area because extensive development has occurred there. While the Eastern Slopes Grizzly Bear Research Team is currently studying these topics as part of a major research effort, our final results will not be available until the year 2000. Valid estimates of population

vital rates for grizzly bear take between five to ten years of data to be bounded within acceptable confidence limits (Hovey and McLellan 1996).

Since scientifically based population parameter estimates were not available we employed four different techniques to derive best estimates of grizzly bear population and habitat status (Gibeau et al. 1996):

(1) We summarized and analyzed data on grizzly bear mortalities in Banff Park during 1971 to 1995;
(2) We conducted a habitat effectiveness analysis (Weaver et al. 1987; USDA Forest Service 1990; Gibeau 1995) of the effects of development and human activities on grizzly bear habitat effectiveness in Banff, Kootenay and Yoho National Parks;
(3) We conducted a security area analysis (Mattson 1993; Puchlerz and Servheen 1994) to determine the size and quality of secure habitat units thought to be available to grizzly bears in Banff Park and the Central Rockies Ecosystem during 1950, 1995, and a future growth scenario.
(4) We conducted a linkage zone analysis (Servheen and Sandstrom 1993) for areas along the Trans-Canada Highway where certain combinations of landscape features suggested reasonable probability for grizzly bears being able to cross. Linkage Zone Analysis was done for 1950, 1995, and a future growth scenario.

Analysis of the mortality database was part of ongoing Master's thesis work by Bryon Benn at the University of Calgary. At the time of analysis it showed a minimum of seventy-three recorded mortalities and removals for Banff Park from 1971 to 1995. The average annual number of mortalities/removals for this period was exceptionally high (2.92/year or 4.87 - 3.65% of the population based on a population estimate of 60 or 80 bears). The Province of Alberta has established a harvest target of 2% of an area's grizzly bear population estimate and currently manages the population to keep total mortality at roughly 4% to allow for population growth (Nagy and Gunson 1990). Based on a population estimate of 60 or 80, this would allow an average annual mortality/removal rate of 1.2 - 1.6/year. Five year average annual mortality/removal numbers varied from a low of 1.6/year to a high of 6.2/year. A decreasing trend in mortalities was exhibited from 1981 to present. This may have been partly due to improved garbage management. Given the grizzly bears' low reproductive capability, it may also have been the manifestation of a significant decline in the local bear population following high annual mortality prior to this period.

Knight and Eberhardt (1985) reported that the death of 1 or 2 adult females could have significant, negative population consequences for Yellowstone grizzlies. In Banff National Park the female cohort accounted for 56% (24 of 43) of all known mortalities/removals since 1971, and 88% (16 of 18) of mortalities/removals since 1983. This is the highest female mortality/removal rate for a 10+ year period known to have been reported for any grizzly bear population.

Mortality type analysis revealed that problem wildlife control actions accounted for 71% of grizzly bear mortalities, followed by highway and railway kills (17%),

unknown (8%), and natural death (3%). Over 90% of grizzly bear mortalities in Banff Park occurred in front-country areas, within a 500m zone surrounding roads and human infrastructure.

Habitat effectiveness modeling is the major component of cumulative effects analysis developed to quantitatively and qualitatively assess the effects of human actions on grizzly bears and their habitat. Results indicate a significant portion of the landscape is only moderately productive habitat (Gibeau and Herrero 1998). The disturbance component of the model suggests wide spread habitat alienation in Banff National Park, an area considered core refugia for grizzly bears in the Canadian Rocky Mountains. Over all, the model suggests that the ability of the landscape to support bears has been significantly reduced.

There is a strong case for preserving areas were grizzly bears will be secure from encounters with humans; where bears can meet their energetic requirements while at the same time choosing to avoid people. Such security areas would foster the wary behavior in grizzly bears that most managers consider desirable. Security area analysis uses GIS technology to identify areas that are functional at the scale of individual foraging bouts for adult female bears. Results of this analysis showed a progressive apparent loss of security areas and habitat quality starting with 1950, through the present, and into the future depicting an ever increasing deterioration of habitat within Banff Park. Fragmentation and insularization of core habitat within the Banff Park landscape was evident and along with that a loss in the ability to foster the wary behavior in grizzly bears.

Linkage zones are combinations of landscape structural factors that allow wildlife to move through and live in areas impacted by human actions. This technique assesses the degree of habitat fragmentation caused by the cumulative effects of human actions in an area. A linkage zone prediction model was developed in the U.S. to identify and quantify these areas of potential carnivore crossing and use in mountain valleys. Results showed a dramatic decrease in potential crossing areas over time. Fencing of the Trans Canada Highway has had a significant effect on the ability of grizzly bears to move across the Bow River Valley. The implications of such a barrier are unknown, although the Trans Canada Highway could have profound effects on grizzly bear passage across the Bow River Valley and ultimately movement throughout the Central Canadian Rocky Mountains.

The combined results of our four types of analyses demonstrated converging evidence that the grizzly bear population and habitat in the Banff-Bow Valley, Banff National Park, and the Central Rockies Ecosystem have been seriously stressed by the combined effects of people's development and activities (Gibeau et. al 1996). The situation was regarded as urgent, especially for Banff National Park which is designated as a protected area.

## THE POLICY DECISION PROCESS

The Canadian National Parks Act requires that a management plan be prepared for each national park, in consultation with Canadians. These plans must reflect the policies and legislation of the department. A management plan guides the overall direction for the park for a 10 to 15 year period, and serves as a framework for all land use and management decisions.

The first management plan for BNP was approved in 1988, based on consultation and research which occurred in the 1980s. By 1994, the recommendations in the plan were being repeatedly questioned from all quarters. Developers and those with commercial interests in the park, viewed Parks Canada as overly zealous in adhering to its mandate of protecting park resources. Environmentalists felt that too much use and development was being permitted and that the long term ecological integrity of the park was in question.

In 1994, the Minister responsible for Parks Canada appointed the Banff-Bow Valley Task Force to review available information on BNP, facilitate public examination and discussion of the information base, and make recommendations as to how the long term ecological integrity of the park could be maintained while allowing appropriate levels of development and use. These recommendations were to be made directly to the Minister, who would then determine how they would be incorporated into a new management plan for the park.

The Minister received the Bow Valley Task Force recommendations in October 1996. She immediately appointed five members of the public to an 'Implementation Advisory Group', chaired by the Assistant Deputy Minister for Parks Canada. They were tasked with reviewing the over 500 recommendations and identifying the principles and actions to be incorporated into the park management plan. A draft park management plan was available for public review and discussion in January of 1997, culminating in a new park management plan approved by the Minister in April 1997.

The new plan, which has a high degree of public support, is strongly based on scientific information. Policy decisions related to bears and other carnivores were significantly influenced by input from the ESGBP. The plan contains an array of actions which, over the long term, will result in improved carnivore habitat effectiveness, improved wildlife corridors and linkages, reduced human caused mortality and a reduction in the habituation of bears to humans. It is a success story in terms of scientific information changing the direction taken by an agency which manages a large piece of land. Why was this scientific effort been able to influence land use decisions so directly? What lessons were learnt here, that can be applied to other planning exercises? There are many reasons, however the key items can be summarized into six areas.

**1. Taking a multi-stakeholder and interagency approach to research.**

Early in the research, the ESGBP determined that the involvement of a multi-stakeholder, interagency Steering Committee was essential (Herrero et al. 1998). This committee provided strategic direction for the project, and helped to focus the research on regional scale cumulative effects. Members on the committee included representatives of the major government agencies that managed land in the East Slopes area, and those who had the potential to impact grizzly bear habitat by their activities, such as ranchers, the logging industry, the oil and gas industry, and recreational users.

The Parks Canada's representative on the Steering Committee (the second author of this paper), ultimately became the main author of the park management plan. Familiarity with the ESBGP, enabled her to promote the recommendations of the ESBGP with senior park managers, and shepherd their incorporation into the plan.

If influencing public policy changes is a project objective, it is extremely important to involve others outside the research community early on in scientific research. It provides balance for the research, and is a constant reminder of how the research results may be relevant to, and used by others. It also enables others, particularly land managers to understand and buy into the research early on, and to influence the design and analysis of research so it meets their needs.

**2. Establishment of a solid public understanding of the issue before discussion of solutions.**

Too often people involved in establishing policy, or writing plans, are quick to outline solutions. There needs to be a great deal of time invested in discussing the issue, prior to identifying options to resolve, so that there is a solid acceptance of the problem and understanding of the issue.

Senior land managers and the public generally do not read scientific articles. What they hear, tends to be through the media when scientists respond to an action a land management agency or developer is proposing.

During the Banff-Bow Valley Study there were many public presentations of scientific information regarding the current state of the ecosystem and specific wildlife species. Scientists took great efforts in their communications. The public heard the description of the issue from various sources. Scientists in different disciplines were saying the same thing; past and current management practices, along with development inside and outside the park, have had a negative effect on ecosystems in the park and surrounding region. The messages were consistent and repeated over and over again, particularly the message with respect to mortality and declining security of habitat for bears and wolves.

This public exposure and examination of scientific information led to a wide cross-section of interest groups accepting that there was an issue with the ecological integrity of the park, particularly as it relates to carnivores.

**3. The message that the ecological integrity of the park was in question was provided by experts from outside the government organization, rather than government employees.**

The information presented by scientists during the Bow Valley Study generally was not new information. Most of the scientists had been undertaking research in the park for some time. Parks Canada had provided much of the information to the public before, however, in the past it had not been viewed as credible, or had not been heard. The Bow Valley Study gave a focus for information sharing, so people listened to what was being provided. The information was also more credible in the public's mind because it was not provided by government employees. Further credibility was given by external peer review by respected scientists not associated with the ESGBP.

In Canada and the USA there is a distrust of governments and government employees. Agencies need to seek the assistance of credible individuals outside of government to publicly discuss scientific information. No matter what the credentials, government employees lack the necessary public credibility.

**4. Key decision makers were directly involved in developing the park management plan, understood the issues and were able to contribute solutions.**

The usual process for park management planning, is that the plan is prepared at the park level with the involvement of the public and park staff, including the Superintendent. It then goes through an approval process with senior Parks Canada managers, and is recommended to the Minister responsible for Parks Canada for approval. This is usually a lengthy process, during which key aspects of the plan must be defended and are frequently changed.

Because of the profile of Banff National Park, and the Bow Valley Study, key decision makers within Parks Canada were directly involved in developing the plan recommendations. As a result, the plan received approval in a very short time, with very few changes, and is strongly defended and supported by senior management of the organization.

Having senior managers involved early on in the planning process was very valuable. In many instances this will not be possible. It will be important however to identify issues that have the potential to become stumbling blocks and ensure that senior managers are familiar with them and aware of the scientific background.

**5. The scientific community was able to provide specific targets and goals in a way that could be incorporated into policy.**

Frequently, scientific information about ecological processes is quite nebulous; it outlines generalities or trends. Senior land managers like to have something more concrete. They want to be able to define specific goals or targets to which the organization should be headed and for which the organization can be held accountable.

In this situation, the researchers conducting the ESGBP were able to define specific targets that could be turned into policy direction. They were able to demonstrate the long term implications of human caused mortality of grizzlies, including management actions required to increase survival of habituated bears. A target was suggested and incorporated into the management plan of reducing the number of grizzly bears killed as a result of human activity to less than 1% of the population annually. This has resulted in a changes in the bear management plan, better management of roadside bear situations, and programs of aversive conditioning.

Targets were also set for habitat effectiveness for each Carnivore Management Unit (CMU) (These are the same as Bear Management Units). Implementation of these will require a concerted effort to manage human use, particularly in backcountry areas. Some actions are already being taken such as eliminating bicycle use from certain areas, discouraging use of some trails through removing trailhead signs and eliminating trail maintenance, and closing some backcountry campsites. Considerable dialogue must take place with users so they understand the concept of habitat effectiveness, and to identify the various ways in which human use could be managed to increase effectiveness. This will include establishing quotas, reservation systems, trail relocations, etc. Although it is unlikely that the targets will be met for all CMUs, Parks Canada must be able to demonstrate that it is actively taking significant steps to improve carnivore habitat effectiveness from where it was at in 1997.

These targets, will make it much easier than in the past for both the public and the organization to measure its progress in achieving the policy direction outlined in the management plan.

**6. Persistence and timeliness are essential.**

Scientifically based recommendations were incorporated into policy because of the persistence of scientists. Scientists viewed the Bow Valley Study process as an opportunity to influence land use decisions. They gave priority to the study and fitted their research finding within the information gathering structure provided. There are two lessons to be learned here. One that scientists need to take advantage of opportunities to influence decisions even when those opportunities arise prior to the research being completed, and when deadlines are ridiculously tight (See Herrero et al. 1986 for another example of this in grizzly bear management). The second lesson is that policy makers

need to create the opportunities for scientific information to be shared with those outside the scientific community, who can influence decision making.

Scientists cannot be passive players, hoping that by publishing research results they will influence decisions, or by writing the occasional letter, or by talking to mangers through the media, or by pounding the table at public meetings. Scientists need to adapt their behavior to the process of information gathering or decision making that is being used.

## IMPLEMENTATION AND MONITORING

The approval of the new management plan in April 1997 was in many ways just a beginning. The implementation of the actions identified has begun. A concerted effort by Parks Canada staff over the past year has resulted in some facilities being closed or relocated, some roads being closed, various public advisory groups being established, a new community plan being developed which follows a low growth strategy, and backcountry use being modified and restricted. Many of the changes which will result in improved grizzly bear and other carnivore habitat effectiveness, are yet to be made. Additional research ,the development of an interactive computer model, and extensive consultation with backcountry users is required before further actions which may result in trail use quotas, elimination or relocation of campgrounds, seasonal closures, etc. can be taken.

Although there is widespread public support for the principles put forward in the management plan, there are groups and individuals questioning specific actions which will impact them directly. To gain support for actions that will directly affect groups and individuals, a major communication effort is being pursued to assist those who will be impacted and the general public in understanding the scientific basis and rationale for the action. Due to the public exposure the research scientists have received in the past, the special interest groups are requesting presentations from the researchers rather than from Parks Canada staff. There is need for ongoing commitment of ESGBP researchers to be involved in communicating with the public for the plan recommendations to be implemented.

Although the first five year phase of the ESGBP is drawing to a close, information on the grizzly bear population and the impacts of land use on their survivorship and activity will need to continue to be collected. Parks Canada will need to have evidence that the various actions that have been taken are actually making a difference on the ground in terms of improving habitat effectiveness and reducing bear mortality. This monitoring program will need to be done on a regional basis. Decisions have not been made as to the intensity of data collection, funding sources, and the agencies involved.

## CONCLUSIONS

Many researchers who study wildland species such as grizzly bears do so because of strong interest in their conservation. Such scientists may be passionate regarding what they perceive to be the need for policy makers to respond to their findings by changing population, habitat and behavioral conditions toward a more sustainable and respectful state. However, policy makers for land and wildlife management agencies work in a professionally complex environment where a host of societal interest groups each tries to get their findings or desires translated into supportive policies and management actions.

We have identified six primary reasons why we think the ESGBP was successful in having many of our research findings and management recommendations translated into policy and management changes. Fundamental to this success was having supportive policy and legislation regarding the importance of maintaining ecological integrity. Based on this the ESGBP was able to argue that the population and habitat status of grizzly bears were good indicators of terrestrial ecological integrity in Banff National Park. Within the framework of this principle the ESGBP was able to recommend measurable scientifically determined population and habitat targets. Senior park planners accepted these recommendations partly because they had been involved and informed throughout the research process, and because the findings and recommendations were supported by scientific peer review. The existence of the ESGBP multistakeholder, interagency steering committee and its dialogue was fundamental to encouraging policy changes supportive of many of the grizzly bear management recommendations made by the ESGBP. The willingness of ESGBP researchers to present inferences based on incomplete data was also important in influencing policy changes. Policy review processes most often evolve independently of research. Researchers interested in influencing policy and management must sometimes be willing to draw inferences from incomplete data, usually at awkward times. The senior author had previous experience of this regarding grizzly bears (Herrero et al. 1986) and was able to draw on this experience.

## LITERATURE CITED

Brunner, R.D. and T.W. Clark. 1997. A practice-based approach to ecosystem management. Conservation Biology 11(1):48-58.

Clark, T.W. 1994. Conservation biologists in the policy process. Pages 575-597 *in* G.K. Meffe and C.R. Carroll, editors. Principles of conservation biology. Sinauer Associates, Sunderland, Massachusetts.

Clark, T.W. and R.D. Brunner. 1996. Making partnerships work in endangered species conservation. Endangered species UPDATE 13(9):1-5.

Franklin, J.F. 1995. Scientists in wonderland. BioScience Supplement: Science and biodiversity policy S74-S78.

Gibeau, M.L., S. Herrero, J.L. Kansas and B. Benn. 1996. Grizzly bear population and habitat status in Banff National Park: A report to the Banff-Bow Valley Task Force. Eastern Slopes Grizzly Bear Project, University of Calgary, Alberta.

Gibeau, M.L. and S. Herrero. In Press. Managing for grizzly bear security in Banff National Park and the Central Canadian Rocky Mountains. International Conference on Bear Research and Mangement 11:000-000.

Herrero, S., W. McCrory and B. Pelchat. 1986. Using grizzly bear habitat evaluations to locate trails and campsites in Kananaskis Provincial Park. International Conference on Bear Research and Management 6:187-193.

Herrero, S., D. Poll, M. Gibeau, J. Kansas, and B. Worbets. 1998. Pages 000-000 *in* Proceedings Canadian Council on Ecological Areas, Annual Meeting 1995: in press.

Hovey, F.W. and B.N. McLellan. 1996. Estimating population growth of grizzly bears from the Flathead River drainage using computer simulations of reproductive and survival rates. Canadian Journal of Zoology 74:1409-1416.

Kellert, S.R. 1994. Public attitudes toward bears and their conservation. International Conference on Bear Research and Management 9:43-50.

Knight, R.R., and L.L. Eberhardt. 1985. Population dynamics of Yellowstone grizzly bears. Ecology 66(2):323-334.

Mattson, D.J. 1993. Background and proposed standards for managing grizzly bear habitat security in the Yellowstone Ecosystem. Cooperative Park Studies Unit, University of Idaho, Moscow, Idaho.

Nagy, J., and J.G. Gunson. 1990. Management plan for grizzly bears in Alberta. Forestry, Lands and Wildlife, Fish and Wildlife Division, Edmonton, Alberta.

Parks Canada. 1997. Banff National Park Management Plan. Ministry of Canadian Heritage, Ottawa, Ontario.

Peyton, B., C. Servheen, and S. Herrero. 1998. An overview of bear conservation planning and implementation. Pages 000-000 *in* The bear conservation action plan, IUCN, Gland Switzerland, in press.

Puchlerz, T., and C. Servheen. 1994. Grizzly bear / motorized access management. Interagency grizzly bear committee taskforce report. U.S.D.A. Forest Service, Missoula, Montana.

Servheen, C., and P. Sandstrom. 1993. Human activities and linkage zones for grizzly bears in the Swan-Clearwater Valleys, Montana. U.S. Fish and Wildlife Service, Missoula, MT.

Servheen, C. 1998. A strategic approach to the conservation of small bear populations. International Conference on Bear Research and Management 10:000-000, in press.