

# REDUCING BEAR–HUMAN CONFLICT THROUGH RIVER RECREATION MANAGEMENT

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**Abstract:** Risk assessment of bear (*Ursus* spp.)–human interaction at river campsites is an effective tool for managing human use, but it only addresses 1 of many issues important for minimizing bear–human conflict along rivers. We suggest strategies to meet the objectives: (1) minimize risk to people and bears at river campsites, (2) ensure that bears do not become conditioned to human food, (3) educate people on ways to reduce their risk of negative interactions with bears, (4) ensure that agencies respond quickly and appropriately to bear–human conflicts, and (5) make human use of rivers more predictable to bears.

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Many managers of wilderness areas are seeking a balance between human use and resource protection. Resource protection is often a priority, but demands for access and use are increasing. Increasing human use may negatively affect bears, other wildlife, and the physical environment, and there are concerns about maintaining human safety if bear–human encounters increase. We developed a qualitative method to assess the risk of bear–human interactions at river campsites (MacHutchon and Wellwood 2002) to help agencies manage human use. We used the assessment method on rivers in British Columbia, Yukon, and Alaska, and suggested that management agencies encourage or require river travelers to use campsites with relatively low risk of a bear–human interaction (MacHutchon and Wellwood 2002). During this work it became clear to us that modifying human use of river campsites would only address 1 of many issues important for minimizing bear–human interaction and conflict along rivers. We believe campsite risk assessment is an important tool for management, but it should be used concurrently with other management strategies. In this paper, we suggest strategies to meet the following objectives: (1) minimize risk to people and bears at river campsites, (2) ensure that bears do not become conditioned to human food, (3) educate people on ways to reduce their risk of negative interactions with bears, (4) ensure that agencies respond quickly and appropriately to bear–human conflicts, and (5) make human use of rivers more predictable to bears.

## CAMPSITE USE

Mitigation measures to minimize risk to people and bears at campsites include encouraging or requiring people to: (1) use open portions of campsites to maximize visibility between humans and bears, (2) stay close to camp and not wander into adjacent forests or shrub-dominated areas, (3) place portable toilets in as open an area as practical, (4) make noise in areas of low visibility, (5) have at

least 1 person stay at camp when others go hiking, and (6) camp in groups of  $\geq 6$ . As popularity of river travel increases, the number of small private groups also is expected to increase. Most serious bear–human conflicts involve groups of 1–2 people, but relative proportions of group sizes in the backcountry is unknown, so injury rate by group size is not known (Herrero 1985, Herrero and Higgins 1999). Nevertheless, no injuries have been inflicted on groups of  $\geq 6$  people (Herrero 1985, Herrero and Higgins 1999), so it is prudent to encourage people to travel and camp in groups of this size.

## HUMAN FOOD AND GARBAGE MANAGEMENT

Controlling bear access to human foods is key in minimizing bear–human interactions. Managers can ensure that bears do not become conditioned to human food by: (1) encouraging or requiring people to bear-proof food and garbage, (2) instituting a pack-in, pack-out policy, (3) informing people of risks to themselves, equipment, and bears of not bear-proofing food or garbage, (4) providing information on camp cleanliness, food choices, disposal of gray-water, and managing human food and garbage, (5) investigating practical methods for bear-proofing food, (6) requiring the use of a fire pan for fires, and (7) requiring the use of portable toilets to collect and remove solid human waste.

Many jurisdictions have spent considerable time and money reacting to complex problems associated with food-conditioned bears (Meagher and Phillips 1983, Dalle-Molle and Van Horn 1989, Keay and Webb 1989, Smith and Lindsay 1989). Proactive management is the most efficient and cost effective way to deal with potential problems (Follmann 1989). Proactively reducing food conditioning among bears can enhance human safety and bear conservation and reduce costs of dealing with food-conditioned bears (Aumiller and Matt 1994). If management agencies become aware of changes in bear behavior and

habitat use, or if data indicate that bear-human interactions are increasing, the source of the problem should be identified and promptly addressed (Leonard et al. 1990).

An attitude we have often encountered among commercial rafting companies is that there has never been a problem with bears; therefore, there is no need to change current practices (MacHutchon 1998, Wellwood and MacHutchon 1999). Currently, however, the potential for bears to obtain human food at occupied campsites is high. It only takes 1 experience with poorly stored food or garbage for a bear to learn how to access human food or garbage (McCullough 1982), and subsequent groups, no matter how conscientious, will suffer consequences. Management agencies in the Yukon and British Columbia are investigating practical ways for bear-proofing food and garbage (T. Elliot, Parks Canada, Haines Junction, Yukon, Canada, and G. MacRae, British Columbia Parks, Smithers, British Columbia, Canada, personal communications, 2000) and the option of requiring commercial rafters to use bear-proof food containers (A. MacDonald, British Columbia Parks, Smithers, British Columbia, Canada, personal communication, 2000). Managers of some recreational rivers in the United States require that people store food in a bear-resistant manner (D. Pendergrast, Gates of the Arctic National Park and Preserve, Alaska, USA, personal communication, 2001; T. Wenum, Flathead National Forest, Montana, USA, personal communication, 2001) or in bear-resistant food containers (letter from B. Brock to commercial operators on 20 March 2000, Katmai National Park and Preserve, Aniakchak National Monument and Preserve, and the Alagnak Wild River, Alaska, USA).

Bear-proof food canisters designed for hikers have successfully reduced frequency of bear problems (Dalle-Molle and Van Horn 1989). Commercial models available for canoes and kayaks are an effective option for small groups. Food carried by rafting groups, however, typically takes up a great deal of space and is heavy and difficult to move around. We tested a portable electric fence set-up around food containers during raft trips. The fence took relatively little space and was quick to set-up. However, the electric fence was subject to human error during set-up, not all campsites had a suitable substrate, and moving food boxes from rafts was labor intensive. Permanent bear-proof storage systems at campsites also require food containers to be hauled from rafts. Steel drums with locking lids are bear-resistant but difficult to fit in rafts. Aluminum boxes that fit in raft frames are available, but hinges and latches are not bear-proof. This type of box, if made bear-proof, appears to be the most practical solution for storing food for large groups on wilderness rivers.

Use of fire pans and portable toilets can also decrease bear visits to campsites. Fire pans reduce the attractive-

ness of campsites to bears by reducing food spills and improperly burned garbage in fire pits. Fire pans also help maintain the aesthetics of campsites by eliminating fire scars and pits. Portable toilets are advantageous because: (1) bears are not attracted to campsites because of human waste, (2) people's movements to a specific toilet location are more predictable to bears, (3) there is less risk of people encountering bears than if they wandered into nearby vegetated areas, (4) campsites do not become human waste dumps, and (5) there is less risk of contaminating rivers, which are used for drinking water.

People are more motivated to follow guidelines when there is a potential cost to disregarding them (Keay and Webb 1989), so agencies should establish penalties for improper food storage once practical bear-proof food containers are available. Penalties for private groups would likely have to be monetary, but penalties to commercial groups could include revoking their permits for a portion of the following year or permanently in extreme cases. This kind of policy can also motivate people to pressure other groups not following guidelines because everyone suffers from someone's negligence. Disadvantages of this type of policy are that it is a challenge to define improper food and garbage handling and there are additional costs for regulation and enforcement.

## PUBLIC EDUCATION AND AWARENESS

We advocate educating people on ways to reduce negative interactions with bears through information on (1) local bear ecology, (2) habituation and food-conditioning, (3) preventing bear encounters and avoiding displacing bears from important habitat, (4) avoiding attracting bears to campsites, (5) how to behave during a bear encounter, and (6) bear deterrents and their limitations. The success of management programs depends on well informed and conscientious users (Keay and Webb 1989, Jingfors 1995). This requires effective public education materials and knowledgeable and conscientious staff. Information that increases people's understanding of bears can increase their appreciation and respect for bears and motivate them to minimize conflicts (Jingfors 1995). In addition, people are more likely to endorse agency guidelines if they understand the negative implications to bears and other wildlife of ignoring the guidelines. There are costs to implement an effective public education program; however, benefits of education and awareness can outweigh costs by reducing bear-human conflicts.

People should be aware that some bears could become human-habituated, particularly at campsites, with increased interaction with humans and no negative consequences. Maintaining safe interactions between humans and habituated bears is achievable if: (1) people are will-

ing to tolerate some bears in close proximity, (2) people behave in a predictable manner, (3) people teach bears to respect human boundaries, and (4) bears do not get access to food or garbage (Jope 1985, Aumiller and Matt 1994).

## REPORTING BEAR-HUMAN CONFLICTS

Agencies can respond quickly and appropriately to bear-human conflicts by: (1) gathering information through a bear observation, encounter, and conflict form given to all river users, (2) encouraging people to report bear conflicts as soon as possible, and (3) monitoring changes in bear-human interactions at campsites.

Quick and accurate reporting of conflicts ensures that agencies respond appropriately and that area closure warnings can be given to departing groups. In addition, bear observation data can provide some information on relative distribution of bears along rivers and near campsites. Bear-human encounter data can provide information on the level of human-habituation of bears and possible areas needing management attention.

The return rate of bear observation forms for the Alsek River, Yukon, has been low (K. McLaughlin, Parks Canada, Haines Junction, Yukon, Canada, personal communication, 2001). This may be because people believe information will be used to reduce their freedom. Gaining people's cooperation may be more achievable if they are aware that information is intended to help maintain the river's ecological integrity and protect bear populations. Management agencies need to investigate incentives for returning forms. A post-season reminder may increase submission rates. Cooperation from commercial groups could be considered favorably in license evaluations, or it may be necessary to make form return a mandatory condition of licensing. For private groups, some token reward may be necessary.

## HUMAN USE

We suggest making the amount and timing of human use of rivers more predictable to bears by: (1) limiting the number of group departures per day, (2) identifying a quota for the maximum number of departures per month, (3) identifying the maximum number of nights a party can spend on a river, (4) encouraging people to restrict their activity to a small area around campsites except where there are specified hiking routes, and (5) limiting the number of off-river trails. Making human use more predictable to bears may minimize disturbance, displacement, and barriers to movement. Management agencies should consider appropriate human use in context of cumulative

environmental effects occurring within their management jurisdiction or adjacent jurisdictions (U.S. Department of Agriculture [USDA] Forest Service 1990).

Agencies can control increases in bear-human conflicts by actively controlling the number, timing, and behavior of humans using backcountry areas (Keay and Van Wagtenonk 1983, Aumiller and Matt 1994). Unfortunately, there is little empirical data on thresholds of human use tolerable by bears (Olson and Gilbert 1994, Chi and Gilbert 1999). In addition, it is difficult to generalize disturbance response among areas because this response depends on the level of human-habituation among bears. The number of habituated bears and their use of an area likely increases, reaches an asymptote, then decreases as human use increases (Mattson 1990). This threshold of human use is unknown; however, the USDA Forest Service (1990), in developing a cumulative effects model for grizzly bears, adopted a level of 80 parties/month over which human use was considered high intensity. Gibeau (1998) subsequently defined the threshold between high and low human use in Banff National Park as 100 people/month/trail.

## CONCLUSIONS

Any river-use management strategy should be considered in the context of clearly defined management priorities to determine the tradeoff between bear conservation and human use objectives (Leonard et al. 1990, Aumiller and Matt 1994). Our suggested management strategies support both sides of agencies' mandates by protecting bears and other wildlife while providing a quality wilderness experience for people. People will have opportunities to view bears in their natural environments, but with reduced risk of negative bear-human interactions. Reductions in human impact on bears also will be important in controlling incremental cumulative effects and be of conservation benefit to bears. We hypothesize that most people will grudgingly accept some short-term expense and restrictions on their freedom if they understand that measures are intended to ensure their safety, maintain ecological integrity of rivers, and protect bears. If river recreation is not managed appropriately, human impact will degrade the wilderness being sought by visitors.

## LITERATURE CITED

- AUMILLER, L., AND C. MATT. 1994. Management of McNeil River State Game Sanctuary for viewing of brown bears. International Conference on Bear Research and Management 9(1):51-61.
- CHI, D.K., AND B.K. GILBERT. 1999. Habitat security for Alaskan black bears at key foraging sites: are there thresholds for human disturbance? *Ursus* 11:225-238.

- DALLE-MOLLE, J.L., AND J.C. VAN HORN. 1989. Bear–people conflict management in Denali National Park, Alaska. Pages 121–127 in M. Bromley, editor. Bear–people conflicts: proceedings of a symposium on management strategies. Department of Renewable Resources, Yellowknife, Northwest Territories, Canada.
- FOLLMANN, E.H. 1989. The importance of advance planning to minimize bear–people conflicts during large scale industrial and transportation developments in the north. Pages 105–110 in M. Bromley, editor. Bear–people conflicts: proceedings of a symposium on management strategies. Department of Renewable Resources, Yellowknife, Northwest Territories, Canada.
- GIBEAU, M.L. 1998. Grizzly bear habitat effectiveness model for Banff, Yoho, and Kootenay National Parks, Canada. *Ursus* 10:235–241.
- HERRERO, S. 1985. Bear attacks: their causes and avoidance. Lyons and Burford, New York, New York, USA.
- , AND A. HIGGINS. 1999. Human injuries inflicted by bears in British Columbia: 1960–97. *Ursus* 11:209–218.
- JINGFORS, K. 1995. Bear–people conflict prevention plan. British Columbia Parks, British Columbia Ministry of Environment, Lands and Parks, Victoria, British Columbia, Canada.
- JOPE, K.L. 1985. Implications of grizzly bear habituation to hikers. *Wildlife Society Bulletin* 13:32–37.
- KEAY, J.A., AND J.W. VAN WAGTENDONK. 1983. Effects of Yosemite backcountry use levels on incidents with black bears. International Conference on Bear Research and Management 5:307–311.
- , AND M.G. WEBB. 1989. Effectiveness of human–bear management at protecting visitors and property in Yosemite National Park. Pages 145–154 in M. Bromley, editor. Bear–people conflicts: proceedings of a symposium on management strategies. Department of Renewable Resources, Yellowknife, Northwest Territories, Canada.
- LEONARD, R.D., R. BRENNEMAN, AND R. FREY. 1990. A case history of grizzly bear management in the Slims River area, Kluane National Park Reserve, Yukon. International Conference on Bear Research and Management 8:113–123.
- MACHUTCHON, A.G. 1998. Bear hazard evaluation at campsites on the Babine River, B.C. British Columbia Ministry of Environment, Lands and Parks, Smithers, British Columbia, Canada.
- , AND D.W. WELLWOOD. 2002. Assessing the risk of bear–human interaction at river campsites. *Ursus* 13:293–297.
- MATTSON, D.J. 1990. Human impacts on bear habitat use. International Conference on Bear Research and Management 8:33–56.
- MCCULLOUGH, D.R. 1982. Behavior, bears, and humans. *Wildlife Society Bulletin* 10:27–33.
- MEAGHER, M., AND J.R. PHILLIPS. 1983. Restoration of natural populations of grizzly and black bears in Yellowstone National Park. International Conference on Bear Research and Management 5:152–158.
- OLSON, T.L., AND B.K. GILBERT. 1994. Variable impacts of people on brown bear use of an Alaskan river. International Conference on Bear Research and Management 9(1):97–106.
- SMITH, B.L., AND D.G. LINDSEY. 1989. Grizzly bear management concerns associated with a northern mining town garbage dump. Pages 99–103 in M. Bromley, editor. Bear–people conflicts: proceedings of a symposium on management strategies. Department of Renewable Resources, Yellowknife, Northwest Territories, Canada.
- U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE. 1990. CEM—a model for assessing effects on grizzly bears. U.S. Department of Agriculture, Forest Service, Region 1, Missoula, Montana, USA.
- WELLWOOD, D.W., AND A.G. MACHUTCHON. 1999. Risk assessment of bear–human conflict at campsites on the Alsek River, Kluane National Park, Yukon. Parks Canada, Kluane National Park and Reserve, Haines Junction, Yukon, Canada.

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