

# ASSESSING THE RISK OF BEAR–HUMAN INTERACTION AT RIVER CAMPSITES

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**Abstract:** The Alsek and Tatshenshini rivers of Yukon, British Columbia, and Alaska, and the Babine River, British Columbia, are seasonally important for grizzly bears (*Ursus arctos*) and American black bears (*Ursus americanus*). Recreational travelers on these rivers use riparian habitats for camping, which could lead to bear–human interaction and conflict. During visits in late summer 1998–99, we used 4 qualitative indicators to assess risk of bear–human interaction at river campsites: (1) seasonal habitat potential, (2) travel concerns, (3) sensory concerns, and (4) bear sign. We then rated each campsite on a 5-class scale, relative to other campsites, for the potential to displace bears and the potential for bear–human encounters. We used these ratings to recommend human use of campsites with relatively low risk.

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Riparian habitats in many river valleys in western North America are seasonally important for grizzly bears (Hamilton and Archibald 1986, Reinhart and Mattson 1990, MacHutchon et al. 1993, Schoen et al. 1994, McCann 1998, Titus and Beier 1999) and American black bears (Reinhart and Mattson 1990, MacHutchon et al. 1998, Chi and Gilbert 1999). Humans frequently use rivers for recreational travel and use riparian habitats for camping. Management agencies are concerned about potential negative effects that increasing human use of rivers may have on bears, other wildlife, and the physical environment. They also want to maintain human safety by minimizing bear–human encounters. Interaction with humans can negatively affect bears by displacing them from important riparian habitat (Reinhart and Mattson 1990, Olson and Gilbert 1994, MacHutchon et al. 1998, Chi and Gilbert 1999), changing bear activity patterns (MacHutchon et al. 1998, Olson et al. 1998, Chi and Gilbert 1999), changing bear habitats (Schoen et al. 1994), or when conflicts occur, leading to the destruction or translocation of bears. Interactions can negatively affect humans through destruction of property, human injury, or death (Herrero 1985). We define bear–human interaction as any activity and its effect involving bears and humans, including observations, encounters, and conflicts. We define a bear–human encounter as a situation when a bear is aware of human presence, regardless of whether people are aware of the bear. During encounters, bears can be displaced, may ignore people, or may approach people. We define a bear–human conflict as a more serious interaction where a bear charges people, people take extreme evasive action in response to a bear, people use a deterrent on a bear, property is damaged, or a bear makes physical contact with a person.

Popularity of the Tatshenshini and Alsek rivers of Yukon, British Columbia, and Alaska, for recreational travel has increased substantially since 1989, coinciding with world-wide publicity generated to protect the Tatshenshini River from mining development (Dill et al.

1997). The Tatshenshini and Alsek river valleys comprise a large proportion of available bear habitat within the parks through which they flow, and the importance of riparian habitats to bears is high (Simpson 1992, Herrero et al. 1993, McCann 1998). The main period of human use coincides with seasonal movement of grizzly bears to low elevations (McCann 1998). McCann (1994) recommended evaluating the risk of bear–human interaction at campsites because of these overlaps in bear and human use. Seeing grizzly bears is a main attraction of travel on the Babine River, British Columbia. Most recreational trips occur in late summer and fall when grizzly bears are at the river feeding on salmon (*Oncorhynchus* spp.). Anglers also intensively use the river at this time (MacHutchon 1998). Consequently, British Columbia (BC) Parks recognized a need to assess risk of bear–human interaction at campsites along the Babine River (A. MacDonald, BC Parks, Smithers, British Columbia, Canada, personal communication, 1998). This paper describes our method for qualitatively assessing and rating the potential for displacement of bears and for bear–human encounters at river campsites on the Tatshenshini, Alsek, and Babine rivers (MacHutchon 1998, 2000; Wellwood and MacHutchon 1999a,b).

## STUDY AREAS

### Tatshenshini and Alsek Rivers

The Tatshenshini and Alsek rivers (59°25'N, 137°40'W) both originate in the Yukon and flow approximately south through British Columbia. The Tatshenshini River joins the Alsek River upstream of the Alaska border, and the Alsek River empties into the Gulf of Alaska at Dry Bay, Alaska. There is a transition from a dry, cold, continental interior climate to a wet, warmer, maritime climate along the Tatshenshini and Alsek rivers, and vegetation communities reflect this climatic transition. The Tatshenshini River has runs of sockeye (*Oncorhynchus nerka*), chinook

(*O. tshawytscha*), and coho salmon (*O. kisutch*). Small numbers of chum (*O. keta*) and pink salmon (*O. gorbuscha*) occur on the lower Alsek River. Common mammals along both rivers include grizzly bears, American black bears, moose (*Alces alces*), and Arctic ground squirrel (*Spermophilus parryii*).

### Babine River

The Babine River (55°20'N 126°50'W) is in north central British Columbia, Canada, and flows north and west to the Skeena River. The upper Babine River has a moderately dry continental climate and the lower river has a moderately wet-to-dry climate transitional between the coast and interior. The Babine River has runs of 6 species of salmon, including sockeye, chinook, coho, chum, pink, and steelhead (*O. mykiss*). Common mammals include grizzly bears, black bears, and moose.

## METHODS

We documented campsites through interviews with park staff, river guides, and other local people. We visited campsites during 21–31 August 1998 on the Alsek River, 7–11 September 1998 on the Babine River, and 30 July–11 August 1999 on the Tatshenshini River. We identified campsites as spots with features such as a shoreline with slow-moving water or a back-eddy for safe boat moorage, reasonable access from the river, clear and flat areas for tents, wind and weather protection, clear water for drinking, and firewood. Presence of fire scars, unnaturally arranged rocks or logs, and disturbed vegetation, surface litter, or soil confirmed campsites.

We evaluated 24 campsites along the Tatshenshini River, 43 along the Alsek River, and 16 along the Babine River. We assessed the potential for bear–human interaction at campsites and within approximately 250 m of the campsite perimeter on the side of the river with the campsite. Rivers surveyed were not a major physical barrier to bears (river channel widths varied from 100–500 m), but we assumed bears on the opposite side of a river would not be encountered by people and would be less likely to be displaced by human activity. We sketched and photographed areas around campsites to indicate relative position of habitats, bear foods, trails, mark trees, and prominent geographic features. We used 4 indicators to assess relative risk of bear–human interaction: (1) seasonal habitat potential, (2) travel concerns, (3) sensory concerns, and (4) bear sign.

*Seasonal habitat potential.*—We compiled a list of bear foods for the rivers and ecosystems surveyed from our research, a literature review, scat analysis, and feeding sign in the field. We described vegetation around each campsite and rated availability (i.e., distribution and abun-

dance) of individual bear foods as high, moderate-to-high, moderate, low-to-moderate, or low. Based on food availability (Herrero et al. 1986), we then rated the overall potential of the habitat to support bears in spring, summer, and late summer or fall. Along the Tatshenshini and Alsek rivers, we considered spring to be 15 May–14 June, summer to be 15 June–21 July, and late summer to be 22 July–30 September based on grizzly bear research of McCann (1998). We considered spring in the Babine River drainage to be May and June, summer to be July and August, and fall to be September and October (Resources Inventory Committee 1999). We assumed that seasonal availability of bear foods was a reasonable indicator of the likelihood of a bear feeding near a campsite. Habitat assessment relied on our experience with the range of habitats available in local ecosystems as well as our research experience and a literature review of bear habitat use and diet within the ecosystems surveyed or ecologically similar areas (Herrero et al. 1986). We compared and rated habitats relative to a benchmark habitat we considered the best available in a particular ecosystem (Resources Inventory Committee 1999). We used a 5-class rating scale. High value habitat was considered to be within approximately 81–100% of the potential of a benchmark habitat. Other classes were moderate-to-high (61–80%), moderate (41–60%), low-to-moderate (21–40%) and low (0–20%).

*Travel concerns.*—We identified geographic features that influenced the likelihood that a bear travelling a river would pass through or near a campsite, such as valley junctions and constrictions in terrain, including rock outcrops, cliffs, cut banks, moraines, and peninsulas. Location of well-used bear trails and mark trees and potential travel routes influenced the travel concerns rating. We rated travel concerns as high, moderate, or low regardless of the season.

*Sensory concerns.*—We defined sensory concerns as features that reduced the ability of bears and humans to detect each other, such as vegetation and topography that limited visibility, noise from rivers or creeks that affected hearing, or wind that affected hearing and smell. We rated visibility concerns independently from other sensory concerns and rated each campsite as high, moderate, or low with no distinction made between seasons. We considered visibility low if it was not substantially obscured within approximately 50 m of the main campsite. Visibility concern was high if visibility was substantially obscured in most directions within approximately 10 m of the main campsite. Visibility concern was moderate when only a portion of area around a campsite was obscured. We subjectively judged noise from a number of locations around a campsite while we assessed habitat. Noise from moving water was most significant when a

campsite was near a steeply descending creek or near a rapid on the main river. The sensory influence of wind was the most difficult to judge because of its transient nature. Some locations, however, were frequently windy from a consistent direction. We learned about typical wind patterns through conversations with park staff, river guides, and other local people. If visibility was restricted more on one side of a campsite than another, prevailing winds were a potentially important influence on the ability of bears to detect humans before reaching a campsite.

*Bear sign.*—We recorded fresh and old bear sign as evidence of use, including tracks, scats, feeding, and beds. Inequities in our ability to detect bear sign existed because some sign were more obvious than others and campsites often only were examined during 1 season. Consequently, these bear signs had a lesser influence on risk ratings than other factors; they were recorded but not rated.

*Synthesis.*—These 4 indicators were subjectively synthesized, and each campsite was rated relative to other campsites for both the potential for displacement of bears and the potential for bear–human encounter in each season. We categorized campsites as having high, moderate-to-high, moderate, low-to-moderate, or low apparent risk. Habitat potential was the most significant indicator of probable bear use in risk ratings because we assumed food and the search for it had the greatest influence on a bear being at a location during a particular season. Other indicators were generally used to modify risk ratings when deemed appropriate, and these other indicators usually had the most influence on the risk of encountering a bear. For example, if habitat potential was moderate, but travel, visibility, and other sensory concerns were high, we rated risk of displacement moderate and risk of encounter moderate-to-high. Likelihood of a bear being in the area was

considered moderate based on habitat potential. Hence, we reasoned that risk of displacing a bear also would be moderate. However, if a bear did come into an area, risk of encountering it would be relatively high because it would be hard for bears or humans to detect each other and the bear would be more likely to travel through camp. Consistency was maintained in all ratings by making assessments relative to other habitats or campsites within the same ecosystem.

## RESULTS

Most campsites had lowest apparent risk of either displacing or encountering bears during spring and highest apparent risk during late summer or fall (Table 1). Public trips primarily occur during summer and late summer on the Alsek and Tatshenshini rivers (McCann 1994, Wellwood and MacHutchon 1999a) and in late summer and fall on the Babine River (MacHutchon 1998). The potential for bear–human conflict on all rivers was highest in late summer through fall.

We recommended management agencies continue to allow human use of campsites rated low or low-to-moderate risk in all seasons. For campsites with a moderate rating in summer through fall, we recommended either closing the site to camping, encouraging voluntary use of lower risk sites, or implementing mitigation measures at the site to minimize risk to people and bears. Generally, we recommended management agencies close campsites with moderate-to-high or high rating. Occasionally, agencies chose to keep a site rated moderate-to-high risk open if there were no lower risk campsites within a practical distance along a river, in which case we suggested alternative mitigation measures.

**Table 1. Apparent risk of bear–human interaction at campsites along the Tatshenshini and Alsek rivers in Yukon and British Columbia, Canada, and Alaska, USA, and the Babine River in British Columbia, Canada, based on visits in late summer, 1998–99.**

Risk rating	Campsites (%) with risk of bear–human interaction																	
	Tatshenshini River (n = 24)						Alsek River (n = 43)						Babine River (n = 16)					
	Spring		Summer		Late Summer		Spring		Summer		Late Summer		Spring		Summer		Fall	
Low	Dis <sup>a</sup>	Enc <sup>a</sup>	Dis	Enc	Dis	Enc	Dis	Enc	Dis	Enc	Dis	Enc	Dis	Enc	Dis	Enc	Dis	Enc
Low-to-moderate	45.8	16.7	29.2	12.5	16.7	12.5	51.2	30.2	32.6	14.0	30.2	16.3	75.0	68.8	25.0	18.8	0.0	6.3
Moderate	25.0	41.7	20.8	33.3	16.7	20.8	25.6	39.5	23.3	46.5	18.6	32.6	25.0	31.3	12.5	18.8	25.0	12.5
Moderate-to-high	25.0	29.2	33.3	20.8	41.7	25.0	14.0	23.3	34.9	34.9	32.6	23.3	0.0	0.0	37.5	56.3	31.3	62.5
High	4.2	8.3	16.7	16.7	20.8	20.8	7.0	7.0	7.0	2.3	16.3	25.6	0.0	0.0	25.0	6.3	31.3	12.5
High	0.0	4.2	0.0	16.7	4.2	20.8	2.3	0.0	2.3	2.3	2.3	2.3	0.0	0.0	0.0	0.0	12.5	6.3

<sup>a</sup> Dis = displacement of bears, Enc = bear–human encounter

## DISCUSSION

We originally worked on a quantitative campsite risk assessment method, but the methods we tried were too time-consuming and expensive, and therefore of limited value for quickly evaluating a large number of sites. The quantitative relationship between the variables we assessed was unknown. There were complex interactions of factors affecting the likelihood of bears using a specific area and encountering people. Therefore, we decided that no matter how they were measured, quantitative measures would eventually have to be qualitatively synthesized to determine overall risk ratings. In addition, several indicators of potential bear use, such as sign, travel concerns, and sensory concerns, could not be effectively measured and always required subjective estimation. As a result, we developed a qualitative assessment method, but based on known or approximated bear habitat use and diet, habitat benchmarks, and professional experience of researchers (Herrero et al. 1986).

Our campsite risk assessment method is relatively quick and inexpensive to use; therefore, it is valuable for management planning over large areas or many campsites. The main disadvantage is subjectivity of the assessments, resulting in ratings that may be difficult to replicate. However, even if risk ratings are not entirely accurate, they should provide a consistent relative measure among campsites. Less experienced individuals could use these methods for campsite risk assessment and planning provided they learn about bear diet, habitat use, and range of available habitats within local ecosystems. Investigators would be most consistent in their ratings by making them relative to other habitats or campsites within the same ecosystem.

All campsites we evaluated had some risk of bear-human interaction because bears use riparian habitats all along the Tatshenshini, Alsek, and Babine rivers. Travelers typically chose campsites with convenient pullouts, flat areas for tents near the river, shelter from wind, clear water, and firewood (Dill et al. 1997). Often, it appeared the potential for interaction with bears was not considered in campsite choice. As a result, management agencies need to restrict human use of highest risk campsites and implement other mitigation measures to minimize the potential for negative bear-human interaction. Specifically, measures need to be in place to minimize the possibility of bears becoming conditioned to human food, and agencies need to quickly respond to any bear-human conflicts at campsites. Managers of other recreational areas have addressed concerns about bear-human interaction by locating campsites and trails away from well used bear habitats or restricting campsite and trail use (Herrero et al. 1986, McCrory et al. 1986). All management of campsite use should be done in the context of clearly defined

management priorities considering the tradeoff between bear conservation and human use objectives (Leonard et al. 1990, Aumiller and Matt 1994).

Management agencies should consider designated campsites or strongly encourage people to use low-risk campsites. Lyman et al. (2000:10) suggested that designated campsites reduce the wilderness character of a river. For some humans this may be true. However, designated campsites can help maintain the overall wildness of a river for bears, other wildlife, and humans by concentrating human use and human impacts, thus giving wildlife access to larger areas of the valley bottom with no human activity. Other advantages of designated campsites are: (1) they can be placed in the lowest quality bear habitat, (2) spatial location and use of campsites is more predictable to bears, (3) bears can better adjust their activities to avoid humans, (4) surprise encounters may be less frequent if bears are aware of human presence, and (5) more localized bear-human conflicts, if any occur. Potential disadvantages of designated campsites are: (1) human food odors may concentrate after repeated human use, increasing campsite attractiveness to bears, (2) restricted camping choices for people on wilderness rivers, (3) unreliable access to some sites as river channels change, and (4) location of some campsites may be difficult to describe or find.

Management agencies should continue to look for alternative low risk campsites. Low risk campsites: (1) are situated in low-value bear habitat, (2) are not located on wildlife travel routes, (3) are open and provide good visibility, (4) are not in windy or noisy areas, (5) do not have eddies or obstructions that may catch and hold salmon carcasses, and (6) flood regularly in the off-season to remove food odors. To benefit river users, good low-risk campsites would be spaced to allow for some user choice and to have shelter from wind, clear water, firewood, and scenic views.

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