Active Fans and Grizzly Bears: Reducing Risks for Campers[1]

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Summary

Where multiple hazards are present, appropriate risk management must consider all hazards. In Kluane National Park and Reserve (Kluane) in southwestern Yukon Territory, Canada, grizzly bears (*Ursus arctos*) and hydrogeomorphic processes represent two hazards with distinct characteristics and influencing factors. Though rare, some interactions between people and bears in Kluane have had serious consequences—for both people and bears. In this study, the objective for the team of biologists and hydrogeomorphologists was to reduce risks for wilderness campers along the Slims West Trail. Biologists identified open portions of geomorphic fans for potential campsites as they had lower bear-related hazards than vegetated areas but they sought the advice of physical scientists due to evidence of hydrogeomorphic events. During subsequent field study, debris flow, debris flood, and flood deposits were identified. We analyzed the combined hydrogeomorphic and bear-related hazard using a risk analysis approach. Combining the two hazards required researchers develop a basic understanding of the other discipline, overcome differences in perspective and approach to reducing risk, and resolution of discrepancies regarding hazard and risk terminology. The result of the analysis is a decision-making framework that can be applied to reduce risks for campers and also reduce risks for bears. The method includes both landscape and site scales and is based on easily understood and readily available information regarding local weather, vegetation, stream bank conditions, and bear ecology and behaviour. Developing this framework required the integration of expertise on the hydrogeormophology of the Slims River valley and its tributaries, and the ecology and behaviour of grizzly bears that use the valley. Educating wilderness campers and providing a method of decision-making to reduce risk supports Parks Canada's public safety program; a program based on the principle of user self-sufficiency. Reducing bear-human conflicts also complements the efforts of Parks Canada to ensure a healthy grizzly bear population.

Introduction

The Slims River valley of Kluane is renowned for its scenic landscape, grizzly bears, and wilderness hiking and camping. In this area, bear-human interactions are common and occasionally unfavourable consequences have resulted (MacDougall and Young, 2005). The mountains of Kluane also produce hydrogeomorphic hazards: debris flows, debris floods, and floods that issue from the mountains onto tributary fans. Fans may not appear threatening landforms due to their gentle slopes; however, major losses around the world occur on fans(Sidle and Ochiai, 2006).

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Despite the efforts of Parks Canada in implementing various aspects of progressive bear–human conflict management, conflicts between people and bears are still reported on an annual basis in Kluane (MacDougall and Young, 2005). In a recent study in the Slims River valley the majority of campsites identified were evaluated as moderate to high hazard for bear–human interaction (Wellwood and MacDougall, 2008). Of concern, alternative locations with low bear-related hazard were identified on recently-active portions of fans that have the potential to be extremely hazardous from a hydrogeomorphic perspective. This collaborative project was initiated to explore the risk to wilderness campers from both hydrogeomorphic processes and bear–human interactions.

Study Area–The Slims River valley has steep slopes with local relief of 1 500 to 2 000 m. Debris flows and debris floods occur in the short, steep tributary watersheds of the main valley forming a series of moderately-sloped fans along the valley margins. Floods are generated in larger tributary watersheds. Local bedrock, relief, and climate provides abundant sediment for fan building, thus all the watersheds in the Slims River valley are "transport-limited" (Carson and Kirkby, 1972). Annual precipitation at Burwash Landing (~45 km to the northwest) is approximately 280 mm, with almost 25% of the total occurring in July. Forests cover much of the lower valley slopes and the less-active portions of fans but active areas on fans have little to no vegetation. Revegetation of disturbed sites can take decades due to soil and climate conditions. The Slims West Trail, one of Kluane's most popular overnight backcountry trails (MacDougall and Young, 2005), is 23 km long and crosses many fans before ending at the designated (and relatively low hazard) Canada Creek campsite. Most trail users spend three days in the valley with the majority of recreational use occurring from June to September; with the peak use period in July and August (MacDougall and Young, 2005). Parks Canada staff estimated that 25% of parties require camp locations along the trail; these campers are the target group for the decision-making framework.

Methods

Five fans and their tributary watersheds were assessed for: (1) the potential to provide campsites with lower likelihood of bear–human encounters; (2) their attractiveness for camping; and (3) their intermediate position between the trailhead and the Canada Creek campsite.

Terminology–Specific to wilderness camping on alluvial fans along the Slims West Trail, hydrogeomorphic processes and grizzly bears are considered hazards when they are present at a campsite location. The probability of spatial and temporal overlap of one of the hazards and a wilderness camper (i.e., both present at a campsite at the same time) defines the probability of exposure. Though bear–human interactions can range from positive to neutral to negative from a human or bear perspective, we only consider grizzly bears as a potential hazard to people and wilderness campers are the only element at risk considered though it is recognized that people can also pose a threat to grizzly bears. Human vulnerability varies with the type of hydrogeomorphic hazard and necessitates a range of management actions. Floods rise slowly, giving advance notice before the situation becomes critical. Debris floods characteristically rise more rapidly, but still provide an indication of the forthcoming hazard. Debris flows arrive with little warning, and the chance of escape following exposure is slim. Human vulnerability to bear-related hazards also ranges from low to high depending on the circumstances. Close-range encounters (<50 m) are more likely to escalate into conflicts, yet as the rate of serious grizzly bear-inflicted injury is low (Herrero, 2003), and encounters are common, human vulnerability to grizzly-bear encounters is generally low.

Hazard Conceptualization–Fieldwork, information collection on watershed morphometrics, and interviews with Parks Canada staff formed the basis of our interpretation of the hydrogeomorphic and bear-related hazards in the valley. Vegetation can be an excellent indicator of past hydrogeomorphic activity (Wilford et al., 2005) and was thus used as the basis of our spatial and temporal classification of fan areas. Four conceptualized fan zones were

identified: bare sediment, herb-dominated, shrub-dominated, and forested. Three levels of hazard were differentiated for each hazard: low; moderate; and high. The levels correspond to the relative probability of the specified hazard occurring in the identified zone of the fan.

Results

Figure 1 is a conceptual diagram describing the hydrogeomorphic hazards based on morphometric profiling and field features including channel locations, sediment deposits, and vegetation communities. 'Good' weather was defined as several days with little precipitation, debris flows and debris floods do not occur in the Slims River valley during 'good' weather. Bullion Creek is an alluvial fan and diurnal snowmelt-induced flooding during 'good' weather creates a moderate hazard.

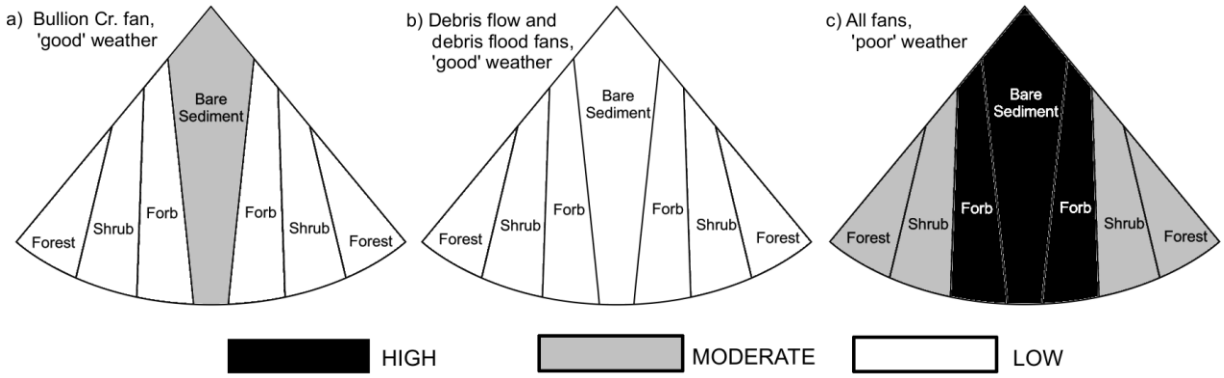

Figure 1: A conceptual diagram of the hydrogeomorphic hazards for a generic Slims River valley fan during 'good' and 'poor' weather.

Four indicators were used to evaluate the bear-related hazard (MacHutchon and Wellwood, 2002): (1) seasonal food plant availability for bears; (2) topographic features (e.g., rock outcrops, cliffs, moraines) that may influence the movements of bears; (3) sensory concerns including restrictions to visibility (e.g., vegetation, geographic features) or noise from creeks that would inhibit bears and humans detecting one another; and (4) bear sign (e.g., tracks, scats, diggings). We defined three vegetative seasons based on grizzly bear research in Kluane documenting seasonal diets (McCann, 1997) and dietary periods (McCormick, 1999): Season A – locoweed (field locoweed) bloom; Season B – post-locoweed bloom; and Season C – soopolallie fruiting season (Figure 2). These seasons also encompass the primary hiking period for the Slims West Trail: Other major food plants were not included as they were less abundant, more localized in distribution, or did not appear to be well correlated with hydrogeomorphic activity.

Combined Hazard Analysis–The hydrogeomorphic and bear-related hazard analyses were combined to support comparisons among zones, during the defined seasons, for the development of our decision-making framework. During 'poor' weather, there are no spatial-temporal situations that have a low rating for both hazards. Throughout the defined seasons and weather conditions and regardless of the fan, the forest has a high hazard rating. The condition of both hazards being low only occurs in the bare sediment and herb-dominated zones, but not on all fans nor all weather conditions. Conversely, instances of at least one of the hazards being rated as high are frequent.

Conclusions

Occurrences of bears entering campsites may require reactive management actions such as translocation or aversive conditioning of bears that can involve significant costs to Parks Canada, and could be at odds with the conservation goals of Parks Canada (e.g., destruction of bears) (Parks Canada, 2004). We have developed a decision-making framework to interpret

readily collected information of the site, vegetative season, and qualitative weather condition to analyze bear-related and hydrogeomorphic hazards. The framework is designed to provide information regarding the hazards so that wilderness campers can make informed decisions about their choice of campsite location. Due to the interaction between the two hazards, 'good' weather allows a selection of low hazard camping scenarios, while 'poor' weather does not offer any low hazard camping on fans. Campers would benefit by being knowledgeable of the framework, and the implications of 'poor' weather, before heading out. The framework, and supporting information, should assist Parks Canada in achieving the dual objectives of public safety and healthy bear populations.

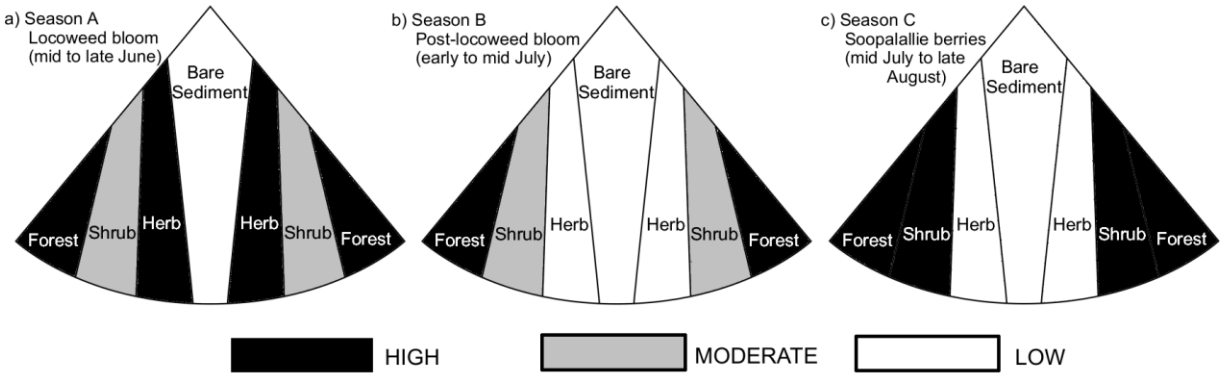

Figure 2: A conceptual diagram of the grizzly bear-related hazard for a generic Slims River valley fan for three bear food-based seasons.

Acknowledgements

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References

Carson, M.A., Kirkby, M.J., 1972, Hillslope Form and Process, Cambridge University Press, Cambridge.

Herrero, S., 2003, Bear attacks: their causes and avoidance: Revised Canadian edition. McClelland & Stewart Ltd. Toronto, Ontario, Canada.

MacDougall, S., and Young, M., 2005, Grizzly bear-human interactions in the Ä'äy Chù' Valley and Sheep Bullion Plateau, Kluane National Park and Reserve. Technical report prepared for Parks Canada, Kluane National Park and Reserve, Yukon, Canada.

MacHutchon, A.G., and Wellwood, D.W., 2002, Assessing the risk of bear–human interaction at river campsites: Ursus, 13, 293-298.

McCann, R.K., 1997, Kluane National Park Grizzly Bear Research Project: Year End Report 1996. Centre for Applied Conservation Biology, University of British Columbia, Vancouver BC, 76 pp.

McCormick, J.E., 1999, A food-based habitat-selection model for grizzly bears in Kluane National Park, Yukon. M.Sc. Thesis, University of British Columbia, Department of Forest Sciences, Vancouver BC.

Parks Canada, 2004, Kluane National Park and Reserve of Canada Management Plan. Parks Canada Agency.

Sidle, R.C., and Ochiai, H., 2006, Landslides: Processes, prediction and land use: Water Resources Monograph 18, AGU, Washington DC.

Wellwood, D.W., and MacDougall, S.L., 2008, Risk Assessments of Bear–Human Interaction: Ä'äy Chù (Slims River) Valley and Sheep-Bullion Plateau area, Cottonwood Trail, and Alsek River, Kluane National Parks and Reserve, Yukon 2005/2006 update and addendum. Technical report prepared for Parks Canada, Kluane National Park and Reserve, Haines Junction, Yukon, Canada.

Wilford, D.J., Sakals, M.E., and Innes, J.L., 2005, Forest management on fans: hydrogeomorphic hazards and general prescriptions. BC Min. For., Res. Br., Victoria BC, Land Manage. Handb. No. 57.