ARTICLE

Visitor Attitudes and Expectations of Grizzly Bear Management in the Canadian Rocky Mountain National Parks

ABSTRACT

Park managers in Canada's Rocky Mountain National Parks are continually challenged to balance visitor needs with those of grizzly bears. While research pertaining to grizzly bear habitat requirements is abundant, human dimensions' research examining the perspectives and expectations of the trail user is not. Guided by principles of behavior intention and its influence on management support, we assessed trail user support for management options regarding grizzly bears in Banff, Jasper, Kootenay, and Yoho National Parks in Canada using an intercept survey. The main findings were in line with predictions, trail users were more supportive of restrictive management options e.g., closing the trail when a female grizzly bear with cubs was in the area rather than a solitary bear; and management options pertaining to modifying bear behavior were largely opposed. Local users who live within these protected areas or who use them daily were less supportive of restrictive management options compared with other trail users. The research supports the proposal that specificity may be an important factor in determining stakeholder beliefs for intervention design. Identification of key influencing factors in the selection of management options for diverse groups of trail users is important if the needs of trail users and grizzly bears are to be managed in a sustainable and risk-sensitive manner.

Keywords

~~Grizzly bear~~, *Ursus arctos, intercept survey, management support, Rocky Mountain National Parks, trail user, human wildlife interactions*

1. INTRODUCTION

While the primary purpose of many National Parks may be to conserve biological and cultural values, they are also important tourism and recreation attractions (Juutinen et al., 2011). Designing management plans that balance biological, cultural, and economical objectives is inherently challenging and a long-standing dilemma (Skibins, et al., 2012), potentially leading to tensions between and amongst managers and stakeholders (Richie, et al., 2012). To increase management effectiveness, decision-makers need to understand the trade-offs between protecting ecological values and visitors' recreational needs (Juutinen et al., 2011).

In Alberta, Canada, grizzly bears *Ursus arctos* are listed as *threatened* under the Alberta Wildlife Act (Government of Alberta, 2011). While there is potential for Alberta's protected areas, including national parks, to act as a source for this recovering provincial population (Sawaya et al, 2012), the amount and type of human activity within these spaces can affect grizzly bears' habitat security and access to high quality forage (Gibeau, et al., 2001). As human recreation within bear habitat increases, so does the potential for human-bear conflict. Thus, protected area managers must also aim to reduce the potential for negative human-bear encounters (Campbell, 2012; Coleman, et al., 2013). Many of the management tactics aimed at prioritizing grizzly bear habitat security rely on the restriction of human access, which is a common tool to reduce the impact of human activity on ecological processes (Petersen, 2000). While this can have safety benefits for the human trail users, it may be seen to reduce visitor freedom (Hall et al., 2010) and is frequently opposed by park residents and local businesses (Richie et al., 2012).

The possibility of viewing bears is part of the attraction of some protected areas and, while contexts vary greatly, for the observer it is often the bear encounter that defines their experience

of the landscape (Nevin, et al., 2012, 2014). In Yellowstone National Park, 81% of visitors listed grizzly bears as one of the top five animals they wanted to see on their trip (Richardson, et al., 2014), while in Denali National Park, seeing a grizzly bear contributed most to visitor wildlife viewing satisfaction (Skibins et al., 2012). Whether driving down a road or walking on a trail, the desire of recreationists to view bears in their natural habitat can impact how bears use that habitat. Determining the extent to which trail users will prioritize grizzly bear needs over their own recreational needs, and their threshold of tolerance for various restrictions on their use of the space, is an important aspect of grizzly bear management in Alberta's protected areas.

Considerable scientific research has focused on the habitat requirements and potential management actions needed to address the recovery of the Alberta grizzly bear population (Government of Alberta, 2011; Neilsen et al., 2006; Northrup, 2012), however, the management policies adopted remain controversial (Chamberlain, et al., 2012; Richie et al., 2012). Attempts to address this complexity in Banff National Park (BNP) began in the early 2000's through collaborative, inter-jurisdictional management based on biological research at the ecosystem scale (Richie et al., 2012). These efforts, which continue today, also actively involve stakeholders representing a cross-section of attitudes and perspective. The overall goal is to define a balance between grizzly bear habitat requirements and human recreational use (see Richie et al., 2012 for a detailed review of these processes).

The controversy surrounding grizzly bear management in BNP may be organized into three strands: 1) the impact human restrictions have on grizzly bear access to high quality habitat; 2) the extent to which these restrictions influence human experiences (Chamberlain et al., 2012); and 3) whether human use restrictions are necessary to ensure human safety. Previous research efforts have detailed perspectives from most major stakeholder groups, including environmental

organizations, commercial operators, local businesses, and management agencies, but little work has been done to assess the perspectives of the trail user. This omission is arguably problematic. Trail users are an important stakeholder in this decision making as they are directly affected by the park manager's decisions. The research presented here addressed this gap by assessing trail user support for various management options pertaining to grizzly bears. These expectations were examined from the perspective of the trail users' beliefs, establishing a key referent groups' thinking around appropriate behavior and the individual actor's appraisal of these options (Campbell, 2012; McFarlane, et al., 2007). In this case, we explored what trail users believed park managers should do in response to a bear being in the vicinity of a trail. Effective grizzly bear management in North American protected areas requires an understanding of trail user perspectives, which can be incorporated into existing knowledge of stakeholder perspectives to ensure a more inclusive and comprehensive approach to management.

Where developing or deciding on interventions is the ultimate aim, the greater the specificity of the normative beliefs held by stakeholders, the greater the proposed utility of the findings (Greaves, et al., 2013). The definition of normative beliefs includes the evaluation of acceptable wildlife management actions associated with human-wildlife interactions (Zinn et al., 1998). Normative beliefs can therefore be used as evaluative standards for what is appropriate and acceptable in wildlife management (Kneeshaw et al., 2004). In the case of grizzly bear management, understanding normative beliefs may increase our understanding of likely supported management options and facilitate decision-making.

Attitudes towards bears may influence a person's normative beliefs regarding their management. These typically result from four inter-related factors: basic wildlife values, perceptions of the particular species, knowledge and understanding of wildlife, and human-

animal interactions (Campbell, 2012; Kellert, 1994). The aim of this research was to define management options that were supported or opposed by trail users whilst simultaneously acknowledging the competing demands faced by protected area managers in areas where recreation occurs in high quality grizzly bear habitat. We operationalized this social research by by asking trail users to define what they thought park managers should do in two distinct scenarios: 1) when a female grizzly with cubs was in the area, and 2) when a solitary grizzly bear was in the area. While these scenarios do not capture all potential age/sex/season combinations they represent the main scenarios from the perspective of users. In addition to defining which management options were the most or least supported by trail users, we proposed two hypotheses:

H_1 - Respondents will be more supportive of measures that prioritize the conservation of bears and their habitat over human usage when a female bear with cubs is using the trail rather than a lone bear.

H_2 – Respondents living in communities with bears and local area residents will be less supportive of management options that restrict human recreation use than respondents from other groups.

2. METHODS

2.1 Study Area

Research was conducted in Banff BNP, Jasper JNP, Kootenay KNP, and Yoho YNP National Parks in the Canadian Rocky Mountains (Figure 1). This contiguous protected area complex covers 20,238km^2 Banff: 6,641km^2, Jasper: 10,878km^2, Kootenay: 1,406km^2 and Yoho: 1,313km^2 of montane, subalpine, and alpine habitat. Priorities in these parks' management plans

include enhancing grizzly bear habitat security, ensuring access to movement corridors, balancing human safety and, providing recreational opportunities (Parks Canada, 2010a, b, c, d). Management plans for all four parks within the study area came into effect in 2010 and will be in place for 10-15 years.

BNP is a unique protected area whose ecology faces numerous forms of human impact (Parks Canada, 2010a), including over 4 million visitors per year (https://www.pc.gc.ca/en/docs/pc/attend. Accessed July 31, 2018) and 8,000 permanent residents in two towns (7,584 in Banff and 1,041 in Lake Louise). The TransCanada highway and a national railway also intersect the park. Large scale commercial tourism developments within the park include three downhill ski resorts and a golf course. A primary consideration in the Park's management plan is to "renew and reinvent" the visitor experience to increase visitation to the park by 2% annually (Parks Canada, 2010a). JNP is the largest of the National Parks in the Canadian Rocky Mountains, hosts fewer visitors than BNP just under 2 million annually but is subject to similar human development pressures including a national highway and railway that bisect the park, a town of 5,236 residents, one large ski resort and one golf course. JNP's management plan also contains objectives to increase visitation by 2% annually (Parks Canada, 2010b). KNP and YNP are much smaller than BNP and JNP, see less visitation and contain less development. Neither have ski hills or golf courses, although YNP does have a small village of 200 residents. KNP hosts just over 400,000 visitors annually (Parks Canada, 2010c), and YNP hosts over 500,000 annually (Parks Canada, 2010d).

Sampling Design

Data were collected from August 16 to September 30, 2013 and from June 1 to September 30, 2014 using an intercept survey within all four national parks of the study area. The first field

season was shorter than anticipated due to a large flooding event in June that closed several trails slated for sampling and delayed the research permitting processes until late July. The field season was separated into two seasons shoulder: June 1 to 30 and September 1 to 30; and peak: July 1 to August 30. Using stratified random sampling, we attempted to sample an equal number of low < 100 people/month, medium 101-1449 people/month, and high >1450 people/month trails in each season in the study area. We used the Parks Canada Master Trails Database (Parks Canada Agency, unpublished data, 2013) to assign human use levels to trail networks. Trail use level categories were defined based on previous research that estimated thresholds of human use before grizzly bear habitat security began to decline (Gibeau et al., 2001; Rogala et al., 2011).

Across all four national parks a total of three low, three medium, and five high use trails were sampled in the shoulder season. In the peak season, one low, three medium, and seven high use trails were sampled respectively; two trails were randomly selected for sampling in both in the shoulder and peak season. We did attempt to sample at least two other low use trails during peak season but did not encounter any trail users during the sampling week, thus there was no data to include in analysis. Each trail was sampled for five randomly selected days in a week including at least one weekend day when overall trail use in BNP nearly doubles from an average of 28,000 people on weekdays to 44,000 people on weekends (Parks Canada, unpublished data, 2016).

Trails were sampled from approximately 9:00am – 1:00pm as most people start recreating within those hours (K. Rogala, Parks Canada, personal communication). An introductory script was provided to 24 trained volunteer interviewers to ensure consistency in approaching and verbally inviting trail users to participate (Hughes, et al., 2009). All parties who approached the trailhead were asked to select one adult group representative to complete the survey, which was

anonymous and took 10-15 minutes to complete. If people declined to participate, they were given a card with web links about the research project and Human Ethics department contacts (Central Queensland University Human Research Ethics Committee, Approval number H13/04-045, 2014). Surveys were only delivered in English. The population of interest was all trail users in the study area during the field season. Interviewers also registered the group size, activity type (hiking/biking/climbing/running), and the number of dogs in the group (dogs are permitted on all trails in the Parks but must be kept on a leash).

Volunteer interviewers were trained in delivery of the scripted survey preamble and questions in a half day workshop in April prior to each field season. Surveys were recorded by interviewers on android tablets using QuickTap survey software (QuickTapSurvey, 2010); data were then analyzed using SPSS version 19 (IBM, 2011).

Survey Design

In natural resource management, examining normative beliefs with a bipolar scale has helped define specific management options that were supported/opposed and clarified the intensity of this support/opposition (Kneeshaw et al., 2004; Zinn et al.,1998). According to Ajzen (1991), bipolar scaling is appropriate for belief strengths and evaluation of those beliefs; the use of a bipolar scale for the investigation of normative beliefs has been used across a range of disciplines (Peters & Templin, 2010). Management options intensely supported or opposed by the majority of respondents display highly skewed distributions towards one end of the scale. Management options that do not elicit strong public opinion in either direction create more equally distributed results and more neutral means (Kneeshaw et al., 2004). Using a similar approach, we assessed trail user support and opposition for various management options relating to grizzly bears and their habitat around hiking trails.

The survey had three sections: 1) bear awareness and recreational preparedness; 2) management options; and 3) demographics and trip details. The first section assessed if people had taken specific optional preparatory steps for their outing in the study area, some steps were directly related to bear safety e.g., carrying bear spray, checking for recent bear activity either on the internet or with a Parks staff person. Other options included investigating trail conditions either online or in person, and basic first aid preparation (e.g., carrying a first aid kit, arranging for a check-in person at the end of their hike).

The second section operationalized normative beliefs as support for 13 different management actions in two distinct scenarios: 1) a solitary grizzly bear in the area, or 2) a female grizzly bear with cubs in the area. Management options were rated on a seven-point bipolar scale ranging from -3 (extremely unsupportive), through 0 (no opinion), to +3 (extremely supportive).

Management options tested ranged from "no management action required - do nothing" to "actively remove the bear from the area - relocation". All options were based on recommendations resulting from previous grizzly bear ecology research (Coleman et al., 2013; Gibeau et al., 2001; Nevin & Gilbert, 2005), existing management tactics in the Canadian Rocky Mountain National Parks (D. Gummer, Parks Canada, personal communication), existing management tactics elsewhere (Matt & Aumiller, 2002), and other approaches that have not been applied previously to grizzly bear management, but are in place elsewhere for other ecological or social reasons (e.g. recreation research pertaining to crowding; Herrick & McDonald, 1992; Manning, 1999). Trail users were asked to state their level of support for aversive conditioning, which was defined as hazing or chasing the bear away from the area around the trail. In addition, a question exploring respondents' attitudes to prioritizing bear habitat over public recreational use of the trail was included.

The third section of the survey asked a series of demographic and trip-specific questions, such as: the type of accommodation people stay in (Brisette, Haas, Wells, & Benson, 2001); whether people were local residents or visitors (Spencer, 2013); how much previous experience they had recreating in the study area (Hughes et al., 2009; Popovicova & Gregg, 2010); the intention of their visit; and the amount of previous planning they undertook for their trip on a whole (Hughes et al., 2009). Additional demographics such as age category, sex, and country of residence were also collected. We also asked Canadian and American residents to define their city or state of residence, which we later categorized into areas with or without grizzly or black bears.

Data Analysis

Based on their mean level of support, management options were descriptively classified as being supported mean = +3 to +1, neutral mean = +0.9 to -0.9, and opposed mean = -1 to -3. Placing management options into these three basic categories was the same between the solitary bear and female with cubs scenarios. We examined the effect of specificity in the data by analyzing trail user support for management options in the two scenarios separately and by comparing support for management options between the many demographic groups. Survey data were not normally distributed; therefore, non-parametric techniques were used for analysis. Testing for differences between support for management options under each scenario: solitary bear vs. female with cubs was done with a Chi-Square test with a Gamma value. The Gamma value describes the degree and direction of skew within data and thus provides a systematic means to determine management options that were significantly more supported in one scenario over the other (similar to Zinn et al., 1998, and Kneeshaw et al., 2004). A Mann Whitney U-Test

ranked management options in order of support in each scenario. A series of Kruskall-Wallis tests were used to test differences in support between demographic characteristics.

Survey error can occur in several areas throughout the methodological approach. While there are estimates for the number of people visiting the study area, there is no precise estimate for the total number of people using individual trails. We reduced potential sampling error by using a stratified random sample to target trails of varying levels of human use. Grizzly bears have been known to inhabit all areas of the park, so we assumed that any trail where surveys were being disemminated could also have a grizzly bear in the area at any given time. We also assumed that trail users had limited knowledge of seasonal grizzly bear habitat preferences and believed it was possible to encounter a bear on any trail in any season. As all surveys were anonymous and we did not collect contact information of respondents and non-respondents, we had no way of further contact with trail users. Therefore, people who refused to participate in the survey, non-responders, were not accounted for in analysis except for calculating the overall survey response rate.

3. RESULTS

3.1 Sample Characteristics

In total, 696 surveys were completed and included in analysis; the response rate was 63% the number of people who participated/total number of trail users approached. The majority of people 93%, n = 646 were hikers; the remainder were engaged in another activity (e.g., biking, rock climbing, running). Two people was the most common group size (49%, n = 339). The vast majority of people were on the trail for either a half day or full day (94%) as opposed to two or more days, and many were Canadian (45%); Americans and Mainland Europeans made up 21%

of the sample each. Only 24% of people lived in or near black or grizzly bear range at the State/Province scale either in the United States or Canada. The sample contained 52% females; the modal age category was 26-35 years old but all age categories were strongly represented. The majority of people had not seen a bear during their current visit to the study area (67%), but nearly half had encountered a bear while hiking in the past, either inside or outside of a protected area (46%); no further details were requested pertaining to what kind of bear was encountered. A large portion of people sampled were visiting the study area for the first time (43%) and were staying in a hotel or hostel (45%). Many respondents were primarily in the park for sporting or recreational activities (42%); others stated seeing wildlife or nature as their primary reason for visiting the park (23%).

3.2 Preparedness to Recreate in Bear Country

Many people took at least two steps to prepare for their recreational experience in the study area (35%), but 17% of people took none of the preparatory steps listed as options (Figure 2). Of those steps taken, carrying a first aid kit was the most common. Although 47% of respondents said they knew how to use bear spray, only 37% of respondents were carrying it when interviewed. The percentage of people carrying bear spray increased with more days on the trail; 35% of half day hiker, 46% of day hikers, and 81% of backcountry hikers carried bear spray. The most common way for people to inquire about either trail conditions or bear activity in the area was to talk with Parks Canada staff; very few people consulted friends or other non-Parks contacts (e.g., hotel concierge). People were more prepared to take steps to reduce the chance of an encounter on the trail by making noise on the trail (90%) and hiking in a group (67%).

3.3 Trail User Support for Management Options

Across the data, management options that were supported related to trail management, options with neutral scores related to managing trail users, and those opposed related to managing bears directly or taking no management action. Significant differences in the support for some management options between the two scenarios were found (Figure 3). In the solitary bear scenario, encouraging people to hike the trail, implementing no management action, and applying aversive conditioning were significantly more supported. Closing the trail, not permitting dogs, and group sizes of 4 or more were more supported if there was a female with cubs in the area. This result supports H_1; restrictive management options were more supported if a female grizzly bear with cubs is in the area.

These differences in support for management options were also reflected in the significant rankings generated by the Mann Whitney U-Test ($p<.01$; *Kendall's Coefficient lone bear* =.516, *Kendall's Coefficient female with cubs* = .554; Table 1). Putting up a warning sign was the most supported management option in both the solitary bear and female with cubs scenarios, whereas taking no management action, applying aversive conditioning, and relocating the bears had the least support. Closing the trail was the second most supported management option in the female with cubs scenario, whereas rerouting the trail was the second most supported option in the solitary bear scenario. In both scenarios, "no dogs permitted" was the third most supported management option.

Significant differences for the support of these management options between some demographic groups were found with the Kruskall-Wallis tests. All of the general trends

discussed below were significant $p<.05$[1]; these trends supported H_2 that respondents in communities with bears, particularly local residents, will respond to management options differently than those living in communities without bears. In the solitary bear scenario, closing the trail was more supported by trail users staying at home (i.e., local residents) and people visiting the park on day trips and out for a half day hike, and less supported by trail users who were camping or out for a full day hike. In the female with cubs scenario, implementing trail opening times was more supported by Americans living in States within bear range, trail users who had never seen a bear hiking, women, people staying in a hotel, and those who visited the study area less than once a year. In the solitary bear scenario, implementing restricted trail opening times was more supported by trail users visiting the park to experience nature/wildlife and less supported by trail users visiting the park for sport recreation.

Management options around limiting the number of people in groups or on the trail were more controversial as reflected by a greater number of demographic groups showing significant differences in level of support. Booking in advance was more supported by backcountry hikers, trail users who visited the park weekly, or users who had planned their trip months in advance than by half day hikers and local residents. Implementing a maximum of 50 people/day on the trail was more supported on trails with low and medium human use levels. In the female with cubs scenario, this action was also more supported by women and trail users who had seen a bear on this visit to the study area. Limiting group sizes to four or more was supported overall and has been applied on some high human use trails in BNP to increase human safety in areas where grizzly bears are active. It was more supported on trails of high human use, by women, and by trail users who had planned their hike days in advance.

[1] A series of tables and figures detailing p-values and significant relationships is available from the lead author

Applying aversive conditioning or relocating the bear were opposed overall. Aversive conditioning was less opposed in the solitary bear scenario by people who were local residents, daily park users, visiting the park for "other" reasons , aged 66+, Canadian, or who had planned their trip weeks ago. In the female with cubs scenario, it was less opposed by trail users who visited the park less than once a year, were from the UK, or were staying at home. Relocation was consistently more opposed by trail users from the UK; in the lone bear scenario it was also more opposed by trail users who were visiting the park for the first time or who were 36-45 years of age.

Overall, trail users were in support of prioritizing grizzly bear habitat use and recovery over human use in mountain parks, a conclusion drawn from responses to the final question on the scale; *median* = 3.0; *variance* = 1.4. Trail users who had seen a bear on this visit to the study area *median* = 3.0, *variance* = 1.1 were significantly more supportive of this prioritization than people who had not *median* = 3.0, *variance* = 1.6 $p<.01$. Trail users from the UK were also significantly more supportive *median* = 3.0, *variance* = 0.7 than users from the USA *median* = 3.0, v*ariance* = 1.8; $p<.01$.

4. DISCUSSION

4.1 Overall Support for Grizzly Bear Management

While increasing visitation to protected areas can increase negative impacts to species, overly restricting tourists can diminish the recreation experience and lead to decreased public support for conservation (Skibins et al., 2012). Our survey results inform grizzly bear management by identifying options where a large base of trail user support exists. Trail users in the study area were supportive of management actions that partially restrict their activity and

prioritize grizzly bear habitat use. This supports previous research from Oregon and Washington where people were supportive of human use limits (Hall et al., 2010), and from public lands in Alberta where people were willing to restrict some uses and access to recreational activities to enhance grizzly bear conservation (McFarlane et al., 2007).

In Yellowstone National Park, seeing a bear was a priority for visitors and the Park incurred an economic benefit from the opportunity of tourists to view grizzly bears (Richardson et al., 2014). In other research, outside of protected areas, attitudes towards bears in an urban-wilderness interface became negative after increased sightings and higher problem-bear activity (Dubois & Fraser, 2013); people who perceived their experience with black bears as negative or neutral were significantly more likely to disagree with wildlife protection (Kretser, Curtis, & Knuth, 2009). We found increased support for prioritizing grizzly bear habitat use if people saw a bear during their visit to the park, suggesting that if people recreating inside protected areas have a positive encounter with a bear, they may be more likely to support management actions that prioritize bears. Enabling safe encounters for the bear and people, combined with improving the public's knowledge of grizzly bears, could foster positive attitudes and garner support for restricting human use of grizzly bear habitat (McFarlane et al., 2007; Røskaft, et al., 2003). These factors could add value to programs in the study area and other protected areas that facilitate safe viewing of grizzly bears adjacent to roadsides or other human use areas e.g., the bear-guardian program in BNP and JNP (Parks Canada, 2015).

4.2 Support for Particular Management Options

In Alberta, residents have been supportive of temporary closures of recreational roads and trails to protect grizzly bears (McFarlane et al., 2007). We found the majority of trail users

expressed a belief that trails should be closed if a grizzly bear was in the area, this support was even higher if it was a female grizzly with cubs. This contradicts assumptions made by some stakeholders who have participated in previous multi-stakeholder planning sessions focused on grizzly bear management (Chamberlain et al., 2012). Participant beliefs associated with other management actions varied between scenarios. Therefore, managers may need to consider if the bear is solitary or accompanied by cubs to understand under which conditions their actions will be judged more or less favorably or unfavorably if seeking stakeholder support (Kneeshaw et al., 2004).

Understanding how beliefs impact and define acceptable management actions can also help shape effective communication and education about management options (Kneeshaw et al., 2004). Some people are not supportive of management actions that may be perceived as causing harm or suffering to an animal (Dandy et al., 2012). Relocation of bears and aversive conditioning were both highly opposed by hikers in this study area, although both of these were less opposed with a solitary bear was in the area. In another study, a sample of visitors to Rocky Mountain National Park in Colorado, USA consistently supported management that actively restored habitat or monitored mountain lions, and consistently evaluated hazing techniques as unacceptable in all situations (Zinn et al., 1998).

Ideally, aversive conditioning is designed to reduce the potential of human-bear conflict and the occurrence of bears entering developed areas to forage on human food and trash by ensuring the bear makes a strong connection between humans and an aversive stimulus (Mazur, 2010). Aversive conditioning is applied in BNP and JNP within this context to discourage bears from seeking food within town boundaries and to ensure human safety (D. Gummer, Parks Canada, personal communication). Having a bear near a hiking trail is a different situation,

however. Future research could examine the difference in support for aversive conditioning when a bear is within human developments, towns, campgrounds compared to when a bear is in less developed areas feeding on more natural sources (e.g., near hiking trails). When aversive conditioning or relocation is deemed necessary, it should be accompanied by studies to monitor the effectiveness of the technique as well as public education programs explaining the reasons for the management action, potential harm and benefit to the bears at the individual and population scale and human safety.

4.3 Differences Between Demographic Groups

Recreationists need to be responded to in different ways to optimize the types, quantity, and likelihood of realizing specific benefits (Daigle et al., 2002). In this research, backcountry users were significantly more supportive of trail management options, such as trail opening times, rerouting the trail, limiting the number of people per day, or requiring people to book in advance. Backcountry user beliefs have been associated with more restrictive management actions that limit trail use, thus increasing more opportunities for solitude (Hall et al., 2010). These more controversial trail management options examined in our study may be better tested for effectiveness in the backcountry where fewer users will be impacted. As these options become more accepted by backcountry users, stakeholder agreement may also increase, and managers can have more confidence in the option selected (Kneeshaw et al., 2004). Should these management tactics be applied, it should be done slowly, explained clearly and monitored closely for effectiveness to reduce human-bear conflict or increase grizzly bear habitat security.

Local visitors ascribe greater importance than tourists to visiting recreation areas to maintain and enhance their personal health and fitness (Spencer, 2013); trail users living locally in our

study area thus may have different goals and expectations of their trail use than visitors. In other research, the more respondents recreated in a protected area, the more protective they were of it (Popovicova & Gregg, 2010). Our results, however, show that local residents of the study area were less supportive of restrictive management particularly not allowing dogs on trails, limiting group sizes, or implementing trail opening times potentially reflecting their beliefs associated with recreational access taking priority over grizzly bear habitat use. Alternatively, their lack of willingness to change their plans may reflect a general familiarity of living in grizzly bear country and an informed confidence regarding the potential of a negative encounter. Residents of a protected area are by definition subject to numerous regulations, thus further restrictions could result in what may be perceived as unnecessary inconvenience (Ishizaki et al., 2011). Local hikers may also have been displaced from a recreational opportunity in the past because of a bear, potentially making them less flexible in altering their plans and thus less supportive of restrictive style management options.

Another potential influence explaining the differences between local residents and visitors is the level of fear various trail users experience when recreating in areas with bears. Perceptions of risk and associated fear can also be a factor in predicting people's attitudes towards bears (Kaczensky et al., 2004) and the management approaches or policies they support or oppose (Johansson et al., 2012). Human fear is a complex emotional and somatic reaction to the experience of danger; in the case of human fear of carnivores it is primarily linked to the perceived danger or harm that the animal represents (Johansson & Karlsson, 2011) and is related to previous positive and negative experiences (Kaltenborn et al., 2006; Kretser et al., 2009). Previous research found people living in rural areas or in close proximity to carnivore species were less fearful of large carnivores than people who lived farther away in areas without large

carnivores (Kaltenborn et al., 2006; Røskaft et al., 2003). Local hikers from our study area are more likely to have had a range of previous bear experiences and may be more positive about interactions with bears (Kretser et al., 2009). This in turn may influence their beliefs regarding when and to what degree wildlife managers need to intervene, therefore, they may not see restrictive management options as necessary. Although we did not directly measure fear in our survey, it is likely an important factor when considering trail user's beliefs and which management options they have most/least support of. This could be a useful avenue for future investigation. While local hikers are still supportive of grizzly bear conservation and associated management approaches, their experience and perspectives bring a complexity to grizzly bear management in the study area.

4.4 Management Implications and Conclusions

As North American society becomes increasingly urbanized, there is a corresponding shift in the way people perceive and value wildlife. This has significant implications for the public's response to wildlife issues; there is a gradual movement away from a domination orientation and a corresponding increase in mutualism perspectives (Teel et al., 2010). Based on this research, Park managers in the Canadian Rocky Mountain National Parks can be better informed about management support for decisions that prioritize grizzly bear habitat use over human use and restrict human access to certain areas when bears are active. Trail users were supportive overall of closing a trail when a bear was in the area and generally opposed to aversive conditioning. Yet in reality, aversive conditioning is typically applied first and a trail is closed as a last resort. Our results suggest that a trail closure could be applied much sooner, if managers deem it necessary

for bear or public safety; rather than reduce trail user satisfaction, this management action may actually meet trail user expectations.

We found that accounting for specificity in this kind of research did frame results and the implications stemming from them. With the differences observed between demographic groups, particularly between residents and visitors, and the differences in support for management options between the solitary bear and female with cubs scenario, future research should explore the role of specificity if their objective is to inform effective management interventions.

Encountering a bear can be a unique part of a hiker's experience in the Rocky Mountain National Parks, however, effects of overuse that impact the biophysical, cultural, and historical resources can change the character of an area (Brisette et al., 2001). In the study area, trail users were more supportive of prioritizing grizzly bear habitat use if they saw a bear. Maintaining the possibility of a safe human-bear encounter in areas where additional impacts to habitat will be minimal (e.g., road-side) may be important to increase public support of management options, particularly those that restrict human use in more environmentally sensitive areas. Our research findings may have implications for multi-stakeholder management-related discussions where views on grizzly bear management are assessed against the impact of various restrictive management actions on visitor experience.

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Table 1: Ranking of preference for management options in Rocky Mountain National Parks for a a) lone grizzly bear is in the area, and b) a female grizzly with cubs is in the area.

a) Solitary Bear Scenario		b) Female Bear with Cubs Scenario	
Warning Sign	11.25	Warning Sign	10.88
Reroute Trail	9.58	Trail Closed	9.75
No Dogs	9.14	No Dogs	9.35
Trail Closed	9.07	Reroute Trail	9.31
Open Times	8.83	Group size > 4ppl	8.60
Group size >4ppl	8.33	Open Times	8.40
Group size <8ppl	7.41	Group < 8ppl	7.33
Max 50ppl/day	6.33	Max 50ppl/day	6.67
Book in Advance	5.51	Book in Advance	5.96
More People per day	4.99	More People	4.37
Aversive Conditioning	3.70	Aversive Conditioning	3.50
No Management	3.46	Relocate	3.49
Relocate	3.41	No Management	3.39

Note: Results are based on Mann Whitney U-test with Kendall's Coefficient. The mean rank listed is the score assigned by the Mann Whitney U-test. Results were significant $p<0.05$ for both scenarios.

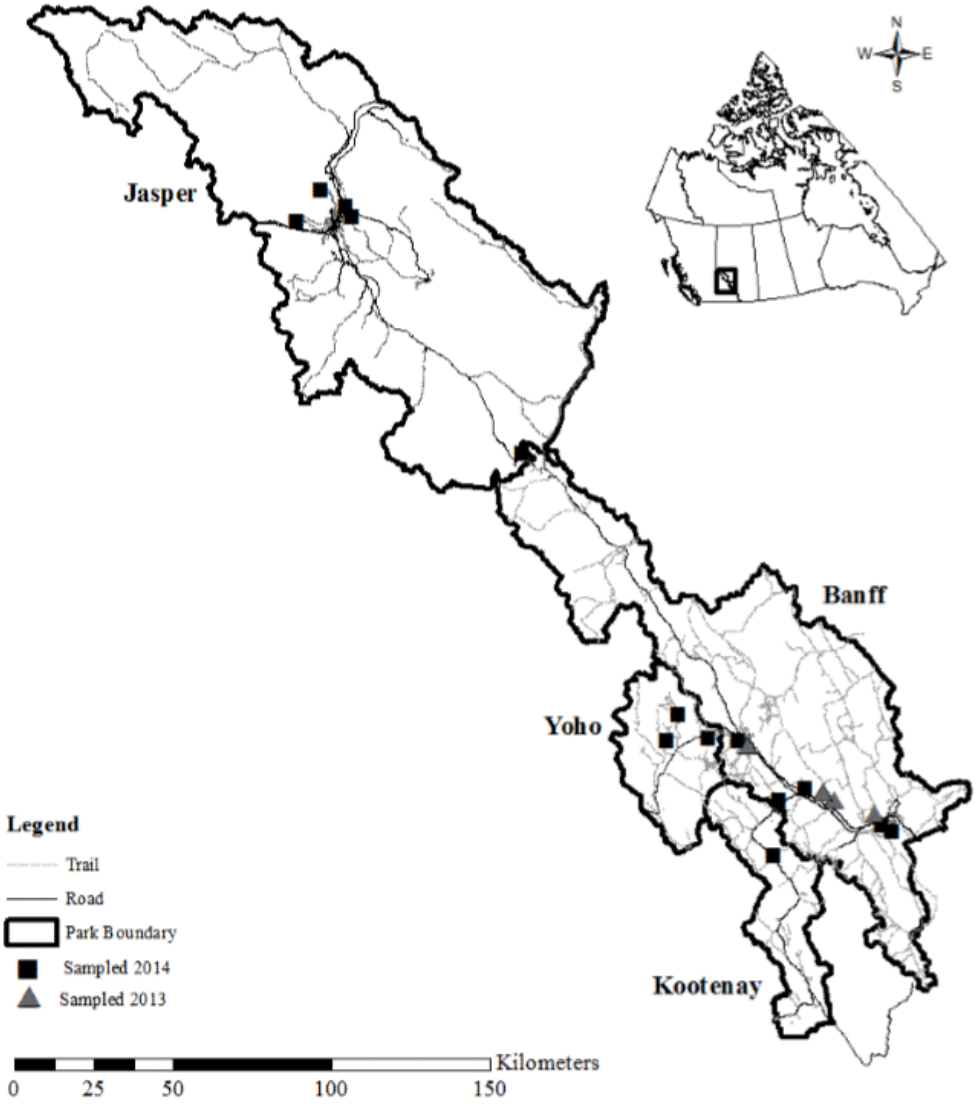

Figure 1: The Study Area: Banff, Jasper, Kootenay, and Yoho National Parks in Canada

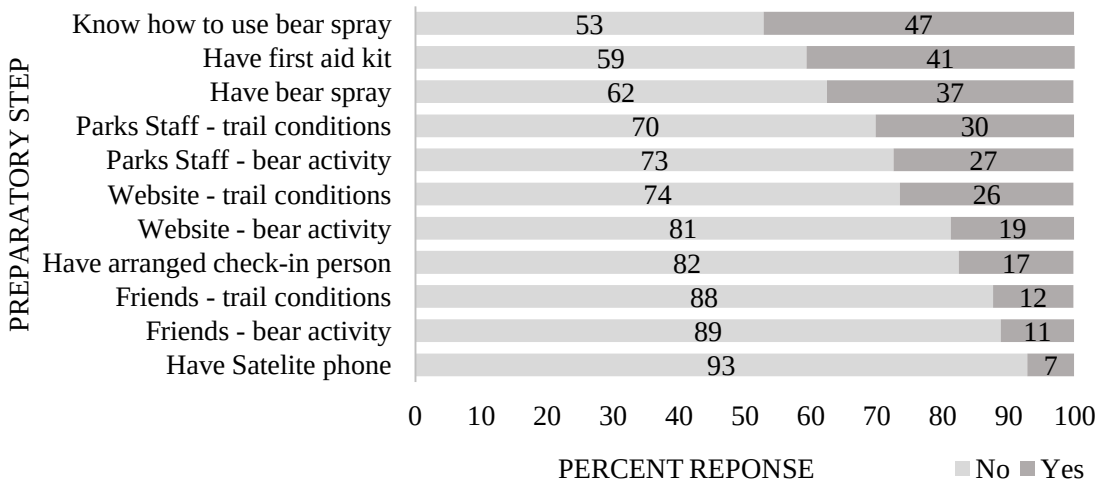

Figure 2: Optional preparatory steps taken by trail users in the study area.

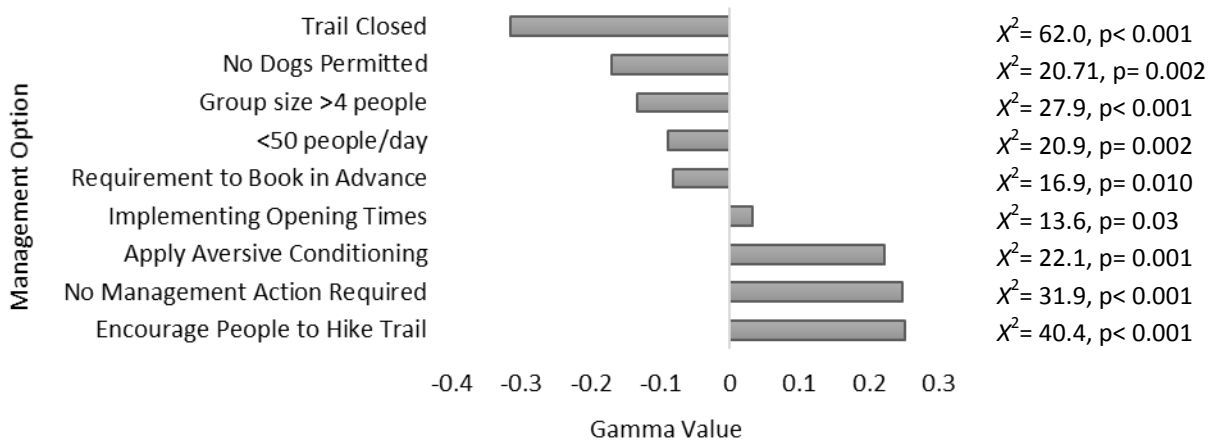

Figure 3: Significant differences in support for management options when a female grizzly bear with cubs is in the area.

Note: Gamma values are a measure of comparison in levels of support for a particular management option. Some management options are not reflected in the figure because there was no significant difference in their level of support between the two scenarios. Negative gamma values reflect management options that were more supported in the female with cubs scenario; positive gamma values reflect options that were more supported when a solitary bear was in the area. Chi-square values and significant levels of each management option are listed to the right, degrees of freedom = 6 for all tests.

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10th June 2019

Dear Editors,

Please find attached our paper on bear management in the Canadian Rockies for your consideration.

Kind regards

Professor Ian Convery
Professor of Environment & Society

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ARTICLE

Visitor Attitudes and Expectations of Grizzly Bear Management in the Canadian Rocky Mountain National Parks

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