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# A Comparative Analysis between Knowledge and Bear Safety Information Utilization by Day Hikers in Glacier National Park

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A Comparative Analysis between Knowledge and Bear Safety Information Utilization by  
Day Hikers in Glacier National Park

By

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B.S. University of Wisconsin- Green Bay, 2008

Thesis

Presented in partial fulfillment of the requirements  
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## ABSTRACT

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Recreation Management

A Comparative Analysis between Knowledge and Bear Safety Information Utilization by Day Hikers in Glacier National Park

Chairperson: Norma P. Nickerson

The purpose of this study was to identify Glacier National Park backcountry day users' bear safety information source utilization, obtain their knowledge level of bear safety, and identify any differences in knowledge level when compared to sources used. The results of this study were intended to provide park managers with a means to more effectively implement the park's bear safety information program.

The study was conducted within Glacier National Park in Montana during the summer of 2011. A survey was given to 540 backcountry day users during their day hikes within the park. A bear safety quiz section was included within the survey to obtain user knowledge level.

The results indicated that backcountry users utilized Glacier National Park information sources more than any other source. Of the entire park provided information materials, text based information was found to be most commonly used to gain bear safety knowledge. Interpersonal communication methods such as ranger talks and conversations with park employees were also often utilized. Backcountry day users were found to know an average of 70 percent of the bear safety material provided by Glacier National Park. This indicates only a moderate level of bear safety knowledge held by park users who hike in bear inhabited areas.

Respondents who primarily utilized Glacier National Park bear safety information were not more likely to have better knowledge than any other respondents. In fact, the highest knowledge level was of backcountry day users who primarily utilized bear safety information from other parks. When compared to those who mainly used other parks' information, respondents who obtained their knowledge primarily from family and friends had a significantly lower bear safety knowledge level.

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## CHAPTER 1: INTRODUCTION

Bear safety information is often used as a management tool employed in areas with human recreation in bear habitat (Gore, Knuth, Curtis, & Shanahan, 2006; United States Fish and Wildlife Service, 2007; National Park Service, 2010a ). Studies have shown that visitor information programs can promote desired behavior (Hines, Hungerford, & Tomera, 1987; Kaiser & Fuhrer, 2003; Bamberg, 2007), which can be applied toward reducing bear/human conflict. Information programs are designed as a soft-handed method for facilitating a visitor's acquisition of knowledge. Information is made available, and the visitor uses this information to acquire a greater degree of knowledge about that topic. Although this process seems simple, there are more complicated factors that influence information acquisition.

Various types of information are available to the visitors of Glacier National Park (GNP) in such forms as pamphlets, signage, ranger tours, instructional videos, and newspapers (National Park Service, 2010a). There are also a plethora of bear safety information sources available in various forms outside of GNP. Examples of this are web sites, other public land agencies, personal contact, television shows, etc. All of these sources are potentially available to visitors. Because each individual has different methods and preferences of obtaining information, people are often exposed to a wide range of bear safety information. A multitude of factors can influence the selection and use of sources. These factors affect a person's approach to acquiring information, and thereby shaping their information source horizon (Savolainen, 2008). An information source horizon is the conglomerate of information sources an individual makes available to him or herself (Savolainen, 2008). The bear safety information a person acquires is



only through sources that are within their information source horizon. However, not every source that provides bear safety information is accurate or detailed enough to be a reliable source (J. Potter, personal communication, April 27, 2011). Consequently, people differ in the amount of correct bear safety knowledge acquired. Pertaining to GNP, the level of bear safety knowledge of the visitors is unknown. Another unknown is what bear safety information the visitor has utilized. Because of this, backcountry day users have drawn GNP management concern due to the possibility of this visitor type being uninformed and unprepared for a bear encounter (J. Potter, personal communication, April 27, 2011).

Backcountry day users are visitors who hike on the backcountry trails but do not camp in the backcountry (J. Potter, personal communication, April 27, 2011). There is little information on where and what information sources these visitors are using to acquire knowledge about correct backcountry bear safety in GNP. Overnight backcountry users are given a backcountry guide which includes safety information and they are required to watch a video that provides instruction on hiking and camping in bear inhabited areas. Backcountry day users are not required to watch the video and therefore are exposed to bear safety information on an entirely voluntary basis. Therefore, the extent of information source use and subsequent knowledge of backcountry users is completely unknown. In order for GNP's bear safety information program to be most effective, these two units of information are important to understand. First, determining what sources are used will provide park manager insight on how pervasive the bear safety information program is within backcountry day user's information source horizons. And second, establishing the level of bear safety

knowledge allows managers to identify important bear safety information that is commonly unknown.

### **Purpose**

The purpose of this study was to identify the bear safety information sources that backcountry day users utilized to acquire bear safety knowledge. The study also examined the overall bear safety knowledge level of these users and identified whether the use of certain information sources influenced knowledge level. This study contributed to the literature by identifying information behavior related to bear safety as well as established GNP's backcountry day user baseline level of bear safety knowledge.

### **Research Questions**

1. Do Glacier National Park backcountry day users actively seek out bear safety information?
2. What is the Glacier National Park backcountry day user's knowledge of correct bear safety information?
3. Which Glacier National Park source for bear safety information is most utilized by backcountry day users?
4. Which source of bear safety information is most utilized by visitors including outside sources?
5. Are there differences in knowledge score depending on information sources used?
6. Are there any differences between backcountry day user demographics/trip recreation characteristics and knowledge of bear safety?

### **Limitations**

Limitations of this study include the location of the data collection, the timeframe of the data collection, and the assumed accuracy of the park provided bear safety information. First, this survey implemented in this study was conducted at only two

locations within the park. Both of these are trails have a higher amount of hikers per day than the majority of the trails within the park. Limiting the data collection to these trails may have excluded backcountry day users who prefer to hike in a more remote setting. Second, the survey was conducted during the summer months. Backcountry day users may also utilize the trails during other seasons. Lastly, the bear safety information quiz section assumes information provided by GNP is the most accurate information available pertaining to bear safety.

### **Definition of Terms**

Backcountry day user - Visitors who hike on the backcountry trails but do not camp in the backcountry (J. Potter, personal communication, April 27, 2011).

Information behavior - The totality of human behavior in relation to sources and channels of information, including both active and passive information seeking and information use (Wilson, 2000).

Information seeking approach - The purposive seeking of information as a consequence of a need to satisfy some goal (Wilson, 2000).

Seeking orienting information - A passive monitoring of everyday life events which may be exemplified by daily media habits such as reading the newspaper before leaving for work, listening to the radio news while driving home, and watching television news in a routine, sometimes absentminded way in the evening (Savolainen, 1995).

Information source horizon - An individual's cognitive construct of different sources which incorporated into horizons that affect the selection of information sources (Savolainen & Kari, 2004; Savolainen, 2008).

## CHAPTER 2: LITERATURE REVIEW

This chapter focuses on relevant research pertaining to information behavior, information sources, information programs, and the relationship these have to bear safety information. First, the study of information behavior is introduced. This concept provides the framework for examining the next topic, information sources. This leads into a discussion of knowledge acquisition as well as the relationship between knowledge and human behavior. The next section integrates these concepts within the scope of bear safety information. Information programs and its role in bear management approaches are then identified. Finally, the chapter closes with a section describing visitor characteristics and the bear safety information program of GNP.

### **Information behavior**

Information behavior is a subject that involves the sum of the processes of an individual's physical and cognitive acquisition of information. Wilson (2000) defines information behavior as "the totality of human behavior in relation to sources and channels of information, including both active and passive information seeking and information use" (p. 4). This engages both the physical and cognitive process of individuals and their 'journey' of information involving, search, exposure, and acquisition of information. This process leads to an end result of either acceptance into knowledge or rejection. The primary scope of information behavior is individualistic and is oriented around the individual behavior rather than a more broad perspective (Wilson, 2000). The focus of information studies prior to information behavior was dominated by the schema that focused on the notion of viewing an information system as a whole rather than the behavior of the user when interacting with an information system

(Wilson, 2000; Spink & Cole, 2006). Information behavior has steered away from this approach by narrowing the scope of study into an individualistic user's perspective of the system. Information behavior delves into the physical and cognitive aspects of a user's approach to acquiring information. This modified approach has been adopted by multiple fields including consumer behavior research, marketing, psychology, health communication research, and a number of other disciplines that take the user as the focus of interest (Wilson, 2000; Savolainen, 2008). This section explores the leading approaches within information behavior and this topic's role within information seeking.

#### *Information Seeking Behavior and Wilson's Contribution*

The information seeking approach (also called problem solving approach) is the most prevalent model in information behavior. T.D. Wilson (2000), a pioneer of this approach, presents his definition as "the purposive seeking for information as a consequence of a need to satisfy some goal. In the course of seeking, the individual may interact with manual information systems (such as a newspaper or a library), or with computer-based systems (such as the World Wide Web)" (p. 49). To put it more generally, information seeking describes the process of attempting to fill in a gap of knowledge. This gap is the primary motivator of information behavior. The seeking of information is driven by the human's attempt to resolve a problem situation (Ingwersen, 1996; Case, 2007). Wording for this problem situation is often author dependent within the information behavior field and is generally interchangeable. Terms that have been employed as synonymous with this concept include information need, a gap between a contextual and desired situation, and a state of uncertainty (Belkin, 1980; Kuhlthau, 1994; Wilson, 2000; Rogers, 2003; Spink & Cole, 2004). Each of these terms is an

analogous description for the user's recognition of the cognitive situation of, in the most basic of terms, not knowing certain information. This emphasis of a problem situation has resulted in the dominant ethos in information seeking research to be the study of purposive behavior within a problem solving framework, borrowed from cognitive science's approaches of problem solving (Case, 2007).

Wilson's 2000 model of information behavior has a degree of integration of the essential aspects of recent research within information behavior. He incorporates pieces of stress/coping, risk/reward, and social learning theory into a model structure that describes the information seeking process as heavily steeped with cognitive and environmental dependents. The general outline of the model shows that information search behaviors occur in order to resolve an individual's uncertainty. This uncertainty is the activating mechanism of the information search process, which sequentially progresses from information seeking behavior to information processing and use. The acquisition of information and its subsequent transformation into knowledge is the clarifier of the uncertainty. The theory identifies the process as cyclical, whereby the end result of information acquisition may invoke a new sequence of the information seeking process.

In light of new research, the information seeking approach has been shown to have its limitations. Although largely considered to be highly relevant in purposive information seeking, it has shown limitations in explanatory power for certain forms of information behavior. Spink and Cole (2004) define information seeking as a subset of information behavior that includes the purposive seeking of information relating to a goal. However, over the past decade there has been dissatisfaction with the limitations of

the information seeking approach, and the limited explanatory power underlying the concepts, models, and the theoretical notions of non-purposive information search (Case, 2007). Newer types of information acquisition methods have also caused researchers to use a more cautious approach in using information seeking as an explanatory model. As Spink and Cole (2006) describe:

The advent of the Internet has also increased the impetus to reconsider the information seeking approach, broadening this dimension to an anthropological level while paying special attention to the communication patterns within people's particular situation or world. The term *information seeking* is becoming less prominent with the advent of new approaches, including everyday life information seeking and information foraging. (p. 26)

This is not stating that the approach is null and void. As far as its utility, this approach has been used as a means for identifying which areas of the field its explanatory power is lacking, and thereby created the opportunity for other approaches to focus on these areas.

The everyday life information seeking approach (ELIS) has gained strength as a prominent competing viewpoint within the information seeking approach (Spink & Cole, 2006). The ELIS approach sees the information seeking field from a starkly different direction. There are currently attempts to integrate models of each to which there has been some disagreement and resistance within the field (Kuhlthau, 2005). Fortunately, ELIS also has complementary qualities with the information seeking approach. More specifically, ELIS has helped fill some of the gaps of the traditional information seeking approach. This literature review will focus on these complementing qualities of the approach for they are most pertinent to this study.



*Everyday Living Information Seeking*

Problems were found when applying the information seeking approach to situations when an individual is not necessarily actively searching for information. This approach originated as a cognitive processes- focused argument to the library information science field (Wilson, 1981). This domain usually focuses on the behavior of an individual seeking out information at a library; an active search (Spink & Cole, 2006). The ELIS model strays away from this and “includes more consideration of human sense making behaviors and more nonacademic and less-formal information seeking behaviors” (Spink & Cole, 2006, p. 27). ELIS takes on a less formalistic perspective towards information search and approaches it from the everyday viewpoint. ELIS uses the term ‘sense-making’ as the descriptor for small scale individualistic theory making (Savolainen, 2008). This viewpoint is well explained by Spink and Cole (2006):

When a gap in sense under an old theory develops in the individual’s world, the individual tries to make new sense, thus creating a new theory. The individual makes new sense by seeking information from the environment, which the individual interprets into sense to build a bridge over the gap. (p. 27)

This concept within ELIS is similar to the ‘uncertainty’ concept within the information seeking approach; however there is a considerable difference. ELIS explicates this seeking behavior within the context of instances other than purposive search. ELIS labeled this as seeking orienting information (also incidental information seeking) (Savolainen, 1995). This is the converse postulation to active information seeking in that the term ‘seeking’ within seeking orienting information refers more to an openness to acquire information rather than an active pursuit. Seeking orienting information is distinctive in that it serves the need of monitoring everyday events

(Savolainen, 2008). Savolainen (2008) succinctly explains this concept, stating “the practice of seeking orienting information may be exemplified by daily media habits such as reading the newspaper before leaving for work, listening to the radio news while driving home, and watching television news in a routine, sometimes absentminded way in the evening” (p. 83). In the sense of an individual’s perceived world, this behavior is a form of an adaptive monitoring system. This system is utilized for the purpose of being up to date on the conditions, as well as ensuring the minimization of uncertainty of the perceived world (Savolainen, 1995).

It has been noted that this type of seeking may at times closely intertwine with active information seeking behavior (Savolainen, 2008). In fact, at times both types of information are sought simultaneously (Savolainen, 2008). Other interactions with both are not uncommon. During an information seeking episode, people may move from one strategy to another (Belkin, Cool, Stein, & Thiel, 1995). For example during the seeking of information a person’s knowledge and goals may change. One could therefore decide to move from a more active, focused information-seeking mode towards a more passive, routine information-seeking mode. Conversely, a person seeking information passively identifies information that increases uncertainty, which causes a behavioral switch to an active search. The type of information seeking that occurs may also be dependent on the individual’s source use habits and preferences.

### **Information Sources**

There are innumerable sources available to an individual who is engaging in information seeking. However, individuals who are trying to resolve an uncertainty

within a specific topic will not necessarily utilize the same source for other topics. For example, in an active search, one person may seek information on the internet while another may consult friends or family. The various approaches within information behavior attempt to identify influencing factors of an individual's preference of sources. This can then predict the selection and use of those sources (Savolainen, 2008). There are some key components within information behavior that dictate and influence source usage.

Information source horizons are an individual's cognitive construct of different sources depending on factors such as time sensitivity, urgency, importance, purposefulness of the seeking, or conversely, seeking orienting information (Savolainen, 2008). Savolainen and Kari (2004) define a horizon as "an imaginary field that opens before the mind's eye of onlooker or information seeker" (p. 418). These factors are each incorporated, consciously or otherwise, into horizons that affect the selection of information sources (Savolainen, 2008). This horizon enables the person to position the relevance of information sources in their ability to provide sense-making of their 'uncertainty' (Shenton & Dixon, 2004; Williamson, 2004). These selected information sources are preferentially positioned in that the most useful sources are placed 'closer' to the individual and less useful sources farther away.

There are a few primary factors that influence an individual's placement of a source in their horizon. A study by Pirolli and Card (1999) applied the optimal foraging theory of evolutionary ecology to information behavior. It emphasizes the efficiency and convenience factors of sources, demonstrating that a seeker may pass up potentially

useful information and exclude it from his or her horizon since there are more easily accessible sources available. This is especially relevant to internet sources with search engines providing a multitude of instant results about specific topics (Spink & Cole, 2006). The level of trust an individual has for a source is also relevant to source selection. A seeker that has identified a certain source to be less trustworthy from previous experience is more likely to distance that source from themselves in their information source horizon (Savolainen & Kari, 2004). This has been a recent concern for Internet source usage due to the massive amount of information available that lacks peer reviews and other methods that assist in confirming the quality of information (Savolainen & Kari 2004; Savolainen, 2008). A notable influencing factor on differentiation of sources is the type of seeking in which the individual is engaged. A purposive information search may cause the individual to utilize sources that aren't regularly used in their seeking orienting information behavior (Savolainen, 2008). More simply put, when people are actively searching for information, they will use information sources that wouldn't normally be used in their day-to-day life habits.

As previously discussed, the preference of source involves a multitude of interrelated factors. Various studies have attempted a generalized categorization of preference. For example, Line's (1971) research has shown that non-library methods of user information seeking, such as talking to relatives or work colleagues, were preferred by the user over accessing information systematically through formal channels. In Williamson's (1998) study, the most frequently used sources among older adults were family members, newspapers, friends, television, printed information, and radio. In their exploration of the internet's place in information source horizons, Savolainen and Kari

(2004) concluded that the Internet does not replace traditional media sources (television, newspapers, radio) in regards to use of seeking orienting information.

The current relevance of these studies should be taken lightly due to the relatively rapid changes in technology in recent years. New technology has enabled quick access to information sources and may change the results of these studies if repeated today (Savolainen & Kari, 2004). This is especially applicable with the recent advances of mobile access to the internet (Sumita & Zuo, 2010). The prominence of the internet is beginning to dominate the searching methods of people who have access to the World Wide Web (Howard, Rainie, & Jones, 2001; Savolainen & Kari, 2004). Overall, the domain of information technology has significantly changed how many people are seeking information, which thereby has changed aspects of information seeking within the information behavior field.

However, there are accepted generalizations that still apply to current information source horizons. In their 2004 study of information seeking of internet users, Savolainen and Kari made a list that categorizes sources commonly present within an individual's information source horizon.

The following source types were identified:

- Human sources (spouse, friend, and acquaintances)
- Broadcast Media (radio and television)
- Printed media (newspapers, magazines, newsletters, pamphlets, books)
- Networked sources (Internet, email, social media)
- Organizational sources (public libraries and associations)
- Other sources (e.g. courses, and the daily living environment)

This list comprises the majority of sources people have within their information source horizon. It must be noted that some of these categories interrelate with other sources. For example, networked sources may involve information that is received from human sources that are also within the individual's information source horizon. With today's prevalence of online newspapers that incorporate video, there is intertwining of printed media, broadcast media, and networked sources. The emergence of social media has also combined certain categories in a similar fashion (Xiang & Gretzel, 2010). Even so, this listing provides an adequate framework of source types that are prevalent within information source horizons of information seekers.

### **Information Use**

Once a source from one's horizon is accessed, information use is the last step that occurs in the information behavior process. A determination, either conscious or non-conscious is made of whether the explanatory value of the information is adequate for incorporation into the individual's knowledge base. According to Wilson (2000),

Information use behavior consists of the physical and mental acts involved in incorporating the information found into the person's existing knowledge base. It may involve, therefore, physical acts such as marking sections in a text to note their importance or significance, as well as mental acts that involve, for example, comparison of new information with existing knowledge. (p. 50)

The process involves the judgment of value in relation to resolving the 'uncertainty' that spurred the information seeking, the filtering of the information to remove inapplicable information, and ultimately the wielding of this information (Spink & Cole, 2006). This use does not necessarily mean that the individual has utilized the information in the physical world. The term use is defined in the more cognitive sense as in causing cognitive transformation (Todd, 1999; Spink & Cole, 2006). Ford (2004) describes this

process as the incorporation of the found information into their pre-existing knowledge base using a cognitive function. It is most simply described as knowledge acquisition. The process can occur across the spectrum of information behavior, from purposive information seeking to the more 'information building' aspect of seeking orienting information. Within seeking orienting information, the act of acquiring the information into knowledge is often less of a conscious transgression than in purposive information seeking.

The actual act of an individual committing specific knowledge to memory can be influenced by the means which the information is communicated. Rogers (2003) found that interpersonal means (family and friends) of information transfer were more effective than formal sources in persuading an individual to accept a new idea. Unfortunately, there is evidence that some interpersonal channels are not accurate sources of information in certain instances (Rogers, 2003). For example, Dorman and Fridgen (1982) found that information derived from family and friends about outdoor related recreation was often less accurate than information transferred through more formal avenues such as brochures. Knowing this, a supposition can be made that individuals are likely to depend on the opinion of others in forming their own knowledge base, even though the information may be inaccurate.

It is important to note that information use does not necessarily mean a change of behavior will occur with the incorporation of knowledge. The process is strictly bound to the cognitive use of the information in order to make more sense of an uncertainty (Wilson, 2000). There are many cognitive and social factors that prevent knowledge

from having a causal relationship with behavior. This relationship between knowledge and behavior is a complex topic that goes beyond the scope of information behavior. Nevertheless, it is important to discuss the knowledge and behavior relationship affiliated with environmental conservation.

### **Relationship between Knowledge and Behavior**

Knowledge, as defined by Case (2007) is “Information that has been sifted, organized, and understood by a human brain” (p. 64). In other words, it is an awareness of something that has been given meaning and has been comprehended (Bates, 2005). In relation to the information seeking process, the acquisition of knowledge has occurred after the individual has committed the information to memory during the information use stage. Further, there is claim within information behavior that knowledge is correlated with related behaviors (Pirolli and Card, 1999). The optimal foraging approach within evolutionary psychology claims that information use is seen as a process in which data gathered from the environment are used to transform the perspective of the hunter–gatherer thus allowing the hunter–gatherer to adapt his or her behavior (Spink & Cole, 2006).

Within the environmental conservation field, studies have shown that knowledge has the ability to influence behavior (Kellert, 1996; Stern, 2000; Kaiser & Fuhrer, 2003; Frick, Kaiser, & Wilson, 2004). The acquisition of specific knowledge is intended to modify their behavior in order to conform to a request. This process is the vehicle to changing or promoting desired behavior. It has also been shown that within the environmental domain, higher levels of environmental knowledge have been empirically



shown to be related to higher levels of accepted environmental behaviors (Stern, 2000; Kaiser & Fuhrer, 2003; Frick et al., 2004).

However, other research has shown that knowledge may not be as effective as a directly influential vehicle for behavior change as once thought (Manning, 2003). For example, a study conducted by Manfreda and Bright (1991) found evidence of only limited behavior change of visitors who were exposed to brochures. Attitude has also been shown to play a role in influencing intended behavior. According to Ajzen and Fishbein's Theory of Reasoned Action (1980), one of the components that determine a person's intention to perform a pro-environmental action is his or her attitude toward the behavior. This theory also states that attitudes are influenced by beliefs, which are shaped by a person's experiences and knowledge. So although knowledge may be less effective as a sole vehicle for influencing desired behavior, its contribution in influencing a person's beliefs is a component in shaping a person's attitude toward a behavior. Even though knowledge is not guaranteed to directly cause desired environmental behavior, it is a significant contributor as a variable that influences these behaviors. This theory is imperative in understanding the role of environmental knowledge and attitudes in relation to behavior.

The inference that attitudes and knowledge influence behavior is supported by a model created by Hines, Hungerford, and Tomera (1987), and reaffirmed by Bamberg's (2007) updated replication. This model introduces six variables that were observed to be the most influential factors in shaping individuals' intentions to act in an environmentally responsible way. Three of these six variables involved knowledge and attitudes as shown:

- Knowledge of issues: a person needs to be aware of the issues surrounding the given environmental subject.
- Knowledge of action strategies: A person needs to know what actions he or she can do.
- Attitudes: A person must have a favorable attitude towards the given environmental topic if they are to perform the favorable behavior.

These variables, in addition to other external influential factors (e.g. verbal commitment, sense of responsibility) aggregate into a prediction model for individuals' intentions to act. It therefore represents knowledge as an important precondition for the development of a behavior (Jensen, 2002). This is supported by numerous studies that have found positive correlations between knowledge and pro-environmental attitudes and behaviors ( Fiallo & Jacobson 1995; Zimmermann, 1996; Caro, Mulder, & Moore, 2003).

In order for a person to engage in desired bear safety behavior, an individual must first have the correct knowledge of bear safety protocol. Correct bear safety knowledge is dependent on the content of the information that a person utilizes to gain their knowledge. There are two primary factors that contribute to knowledge level: the means in which the person sought and engaged with the bear safety information, and the quality, content, and characteristics of this utilized information. In the next section, these factors are discussed in further detail.

### **Information Behavior, Sources, and Bear Safety Information**

The information behavior approach to information acquisition provides a framework for how and why people obtain information about bear safety. Within this structure, the multiple ways bear safety information is obtained can be identified. Information behavior can be broken down into active search and seeking orienting

information (Wilson, 2000; Savolainen, 2008). Though these approaches are not mutually exclusive behaviors, separating them allows the identification of the primary differences between each. It may be inferred that purposive seeking of bear safety information occurs with the goal of acquiring knowledge about how to be safe within bear inhabited areas. The seeking individual is actively attempting to reduce his or her uncertainty. This uncertainty, which in this case is the lack of knowledge of proper bear safety procedures and precautions, is the driving force of the information seeking behavior. Case (2007) succinctly describes this by explaining that these behaviors are motivated by the recognition of missing information. An example of this is a person looking on a national park website, seeking instruction on how to react to a charging bear.

In the everyday living information seeking approach, there is the seeking orienting information behavior. In this approach the information received is gathered in a more passive fashion or ritual based behavior that people engage in day-to-day life. This type of information acquisition can be described as coming across the information by chance (Spink & Cole, 2006). An example of this in terms of bear safety information could be typified by a person scanning the newspaper and coming across an article about a bear attack that provides some safety recommendations. Information seeking behavior is also related to the management of risk. Accessing information is important so people can deal with risky situations that may arise (Pettigrew, Durrance & Unruh, 2002). In fact, several studies have found a positive relationship between risk perception and information needs, which in turn affect a person's information seeking behavior (Neuwirth, Dunwoody & Griffin, 2000; Strating, Van Beuningen, Kuttschreuter, &

Gutteling, 2004). Recreating within bear inhabited areas come with inherent risk of a possible bear encounter. Therefore, the individual's perceived personal risk in bear encounters influences their degree of information seeking behavior.

Regardless of the specific information behavior the person is engaging in, the characteristics of the source affect what knowledge is being acquired. The accuracy of the source is a paramount factor for people seeking correct information. Bear safety information is not exempt from this statement. There are differing opinions on what is considered proper bear safety methods, depending on the variety of circumstances of which a bear can be encountered (Brown & Conover, 2008). However, there are misconceptions about bear safety that inadvertently promote incorrect information (Morgan, Davis, Ford, and Laney, 2004). Protected area managers have developed methods to combat incorrect information acquisition by making correct information publicly available.

Within protected areas that support bear populations, managers often employ strategies that attempt to educate people about bear safety procedures. These information programs are often declared to be crucial components of bear management plans (Gunther, 1994; USFWS, 2007; National Park Service, 2010b).

### *Bear Management and Information Programs*

With a steady increase of people visiting public lands, there is added pressure placed upon managers to confront issues that affect the safety and protection of both the area's resources and the visitors recreating within the land. This is especially true within bear inhabited areas that are tourism and recreation destinations (Mattson, Herrero, Wright, & Pease, 1996; Herrero & Fleck, 1990). Bear management has had a tumultuous

history in protected areas and parks with bear populations. In the 1950's and earlier, bear management practices often involved either culling the resident bear population or providing food to them in strategic locations for visitor viewing (Gunther, 1994; Gniadek & Kendall, 1995). The latter practice eventually led to incidents which resulted in the injury or death of bears, humans, and sometimes both. In time, bear management took on a more conservation oriented approach. The 1960 National Park Service Bear Management Plan was the turning point in bear management methods. This plan included guidelines that called for increasing visitor education about bear behavior, methods for reducing conflicts, and proper food storage (Gniadek & Kendall, 1995). New information was provided to the public which promoted behaviors that followed this new management method. Over the years, best available science was used to improve these bear safety recommendations, resulting in more effective bear safety information. In a 1995 report by Gniadek and Kendall, they declared the new management plan has been successful in reducing human and grizzly conflict.

Today, bear/human interaction is still a primary concern amongst land managers, especially with an increasing number of the public who recreate within bear habitat. Many areas that experience high density visitation within bear habitat have employed bear management plans. These management plans often focus on bear-oriented strategies that stifle nuisance behavior such as habituation to humans, property damage, and the killing of livestock (USFWS, 2007; Gniadek & Kendall, 1995). Strategies for this include the use of aversive conditioning, capture and relocation of the bear, and removal from the wild (USFWS, 2007). Human oriented management strategies are also utilized. Strategies of this type involve providing bear proof storage devices, making bear proof

trash receptacles available, implementation of citations to rule-breaking actions, and other related methods (National Park Service, 2010a). In addition to this, more indirect methods are frequently utilized which include information programs (Gore et al., 2006).

To assist with meeting management objectives, land managers employ two main types of visitor management strategies. The first is direct, which is regulatory such as rules and/or sanctions. The second is indirect which primarily focuses on visitor education, often in the form of information programs (Duncan & Martin, 2002). This management tool is stressed to be one of the most integral components of bear management plans (National Park Service, 2010a). The indirect type of management has been found to be favored by visitors (Hendee & Dawson, 2002). It has also been shown to be the preferred strategy over enforcement or sanctions by managers of protected areas (Passineau, Roggenbuck, & Stubbs, 1994; Hendee & Dawson, 2002; Marion & Reid, 2007). In the realm of protected area management, influencing visitor behavior to assist with meeting management objectives can be a particularly complicated challenge to overcome. To facilitate meeting these objectives, managers frequently employ educational based strategies designed to increase knowledge (Cole, Hammond, & McCool, 1997), promote conservation behaviors (Kohl, 2005), and address uninformed actions (Manning, 2003). Research suggests that information programs experience success in achieving these goals. Manning (2003) and Marion and Reid (2007) found visitor education appears effective in influencing knowledge, attitudes, and behavior of visitors to protected areas, and therefore were found to be a beneficial management strategy.

Information programs have frequently been used to enable visitors to acquire knowledge about safety while recreating in bear habitat. The main goal of information programs is to facilitate the visitor's acquisition of information about a certain topic. Many management plans have institutionalized specific bear-related programs to reduce conflict and advance conservation goals (Gore et al., 2006). The acquisition of proper bear safety procedure information facilitates desired visitor behavior, thereby promoting successful coexistence (Gore et al., 2006). In fact, Herrero (2003) stated in regard to recommendations of reducing bear attacks, "most [management] recommendations focused on conveying knowledge regarding bear behavior" (p. 53). Further supporting this, the Fish and Wildlife Service stated in their Final Conservation Strategy for Grizzly Bear Management in the Great Yellowstone Area (2007), "Knowledge about bears and acceptance of grizzly bears by people and groups that live, work, and recreate in grizzly bear country are key to the long-term conservation of a healthy grizzly bear population. Continuing specific outreach messages and techniques tailored to the needs of these groups is essential" (p. 4).

### *Bear Safety Information Sources*

#### *Glacier National Park Provided Bear Safety Information*

As stated within GNP's Bear Management Plan (2010), one of its objectives is to "inform visitors and potential visitors of the presence of bears and inherent dangers of visiting bear country" (p. 3). A detailed plan to reach this objective is highlighted in GNP's Bear Management Guidelines (2010). This includes a section which describes the park's plan of providing visitors bear safety related information.

The section divides the protocol for information dispersal to visitors into four categories:

1. Before Visitors Arrive in the Park - This category states that interpretive programs will be available to visitors, schools, and organizations throughout the year; bear related publications will be available at all visitor information facilities outside the park border; the public Glacier National Park website will contain educational information on bears, and all responses to mail inquiries will include information concerning bears.
2. Visitors entering and traveling through the park - printed alerts about bears will be provided at all staffed Park entrance stations. In addition to this, the Waterton/Glacier folder and/or the Waterton-Glacier Guide, each containing information about bears, will be provided. A sign will be posted at each unstaffed entrance station informing that bears inhabit Glacier and are potentially dangerous. Bulletin boards containing warnings and bear safety information will be displayed in all automobile campgrounds. A sign providing measures to minimize risk of hiking and camping in bear country will be located at each trailhead.
3. Scheduled Interpretive Programs and Walks - All public programs will emphasize: proper food and garbage storage, inherent dangers of hiking in bear country, not to hike alone, and explain the closure system (closure of trails due to bear activity).
4. Backcountry Information - backcountry users are each given a backcountry guide that includes a section on backpacking and bears. Backcountry visitors are required to watch a video which includes instruction on hiking and camping in bear country.

The two main timeframes when visitors can access information are before their trip, and during their trip. Within these management guidelines, the method most widely available to visitors before the trip is the park website. The website includes a section providing a significant amount of bear safety information, and is one of the most comprehensive sources provided by the park overall. A wide variety of park provided bear safety information is available to the visitor during their trip. These include the interpretive walks, park signage, the park newspaper, bear related pamphlet, personal communication with park employees, and a bear safety video and backcountry guide for



overnight backcountry users. This bear safety information is provided because GNP has many hikers who utilize the backcountry trail system.

Hikers within the park are most often separated into two distinctive categories: backcountry day users, overnight backcountry users (J. Potter, personal communication, April 27, 2011). Backcountry day users are visitors who hike on the trails within the park but do not camp within the backcountry of the park the same night. Overnight day users also hike on the trails within the park, yet camp within the backcountry of the park. Visitors who hike on trails and camp in designated front-country campgrounds are still considered backcountry day users.

Out of the two previously mentioned types of hikers in GNP, backcountry day users are exposed to less park provided information pertaining to hiking safely while in the backcountry. Overnight backcountry users are given a backcountry guide which includes safety information and are required to watch a video that provides instruction on hiking and camping in bear country. Backcountry day users are not required to watch the video and therefore these users are exposed to bear safety information on an entirely voluntary basis. Since both types, by definition, are hiking on trails within the park, backcountry day users are potentially more at risk to be uninformed if an encounter with a bear occurs.

#### *Bear safety information sources unaffiliated with Glacier National Park*

As described earlier, there other sources available to backcountry day users that are not affiliated with GNP's bear information program. Examples of communication measures that visitors can utilize to access these are mass media (websites, television

programs, newspapers, magazines, etc.), interpersonal communication (friends, relatives, peers), and even other protected areas' bear safety information programs. Although there likely are other sources available that provide accurate bear safety information that can be applied within Glacier, there is a risk of obtaining incorrect information when using sources besides GNP provided information. Even other sources that are usually considered to have reliable bear safety information (e.g. other federal or state protected area agencies) may have information that does not apply to GNP. The primary reason for this is that there are very few areas in the United States that have a grizzly bear population. In a study by Brown and Conover (2008), different tactics were recommended in certain situations depending on the species of bear. Overall, the use of wrong information puts an individual in jeopardy of obtaining false knowledge which can lead to incorrect actions, potentially endangering both the human and the bear.

### **Summary**

In summary, this chapter began with a general introduction to information behavior, a leading theory of the human actions involved in information search. Within this, components of the primary approaches within information behavior were introduced. These approaches provide insight into what is the primary motivator of people engaging in information search. Further, the types of information seeking that people participate within their daily life were described. It was found that information behavior has been utilized by a multitude of academic fields and is considered to be an interdisciplinary concept.

Next, the chapter reviewed the subject of information sources. The concept of sources within a person's life was termed as information source horizons. Information source horizons provide reasoning for why certain people use sources for specific subjects. The placement of a source within a specific individual's horizon is due to a myriad of physical, cognitive, and social influences. A generalized list of source types was given. The topic of information use was introduced and expanded upon. The characteristics of the relationship between knowledge and behavior were also included.

The concepts of information behavior and information sources were further discussed by incorporating them within the scope of bear safety information. This section explained the different ways people engage in information seeking of bear safety information, and the sources commonly utilized for this behavior. The chapter then delved into bear management methods and the role of information programs within these methods. The concluding section introduced GNP and described the common categories of visitors as well as the details of bear safety information that is available, both affiliated and unaffiliated with GNP.

## CHAPTER 3: METHODS

### Research Approach

This is an applied research study that examined the bear knowledge of visitors to GNP and the information sources used for gaining bear knowledge. The objective testing of their bear knowledge was used as the dependent variable against information sources, demographics, and behavior within bear territory. A multi-part survey was used to understand select demographics and trip characteristics, information sources, and bear safety knowledge level of the park's backcountry day users. The use of this research method allowed for more information to be generated through a greater sample size. This was necessary due to the substantial differentiation of visitor demographics within GNP, as this destination is visited by people who are diverse in residence, age, education, recreation habits, and most importantly, bear knowledge and source use. A large sample size was needed in order to maximize validity during analysis and provided a better means of generalizing backcountry day users within GNP.

### Study Area

GNP is located in northwestern Montana and borders Canada along Glacier's northern side. The park stretches over one million acres of the Rocky Mountains and straddles the continental divide. The Flathead National Forest and the Lewis and Clark National Forest borders the west and south side of the park, respectively. The east side is bordered mainly by the Blackfeet Indian Reservation. GNP is a major tourist destination and the main visitor activities within the park are nature-viewing and hiking. There are over 700 miles of hiking trails within the park, with many opportunities for day hikes.

One of Glacier's main wildlife attractions is the resident bears. Over 300 grizzly bear and 500 black bears have GNP land in their roaming territory (J. Waller, personal communication, July 7, 2011).

### **Intercept Sites and Schedule**

Avalanche Lake and Iceberg Lake trails were the intercept site locations. Each trail is a popular day hiking destination within bear territory. Both trails have high volumes of hikers each day, allowing for a high number of survey respondents.

The Avalanche Lake trailhead is located in the Lake McDonald area of the park, 15 miles from Apgar along the Going-To-The-Sun Road. The Avalanche Lake survey area was at the end of the trail at common rest areas beside the lake. The rest and viewing sites promoted willingness to participate in the study. The Iceberg Lake trailhead, located in the Many Glacier area, is in the northeastern portion of the park. The Iceberg Lake survey was administered on the trail at the junction of the Iceberg Lake trail and the trail leading to Ptarmigan Tunnel. This location was chosen for its high foot traffic count and allowed the surveyor to intercept backcountry day users hiking to both locations. Further, both of these sites have shown to be in the upper tier of grizzly bear density within the park (Kendall, Stetz, Roon, Waits, Boulanger, & Paetkau, 2008).

One component of the area selection criteria was high concentration of backcountry day users. However, these trails are also popular areas for people staying at nearby campgrounds or vehicle-bound tourists that hike on only a small portion of the trail near the trailhead. These visitors commonly hike less than a few hundred yards and are on the trail for less than 10 minutes, primarily to locate areas to photograph. To

ensure that only backcountry day users were surveyed, the intercept sites were located at least two miles from the trailheads.

The surveys were administered in the Avalanche Lake area from July 16 to July 20, 2011. Surveying in the Iceberg Lake area was conducted from July 30 to August 3, 2011.

### **Sampling Frame**

The sampling design included only GNP backcountry day users, visitors who hiked within the park trail system but did not obtain a backcountry permit, and therefore did not use a backcountry campsite. Visitors considered backcountry overnight users were not included in the sample. To obtain a satisfactory sample, different types of backcountry day use had to be identified. The Avalanche Lake area is often frequented by backcountry day users who are looking for a short hike with rewarding views (J. Potter personal communication, April 27, 2011). This ease of access to good scenery results in Avalanche trail being one of the most visitor dense trails within the park with up to two hundred visitors per hour at peak times. The Iceberg Lake trail is a trail that requires more hiking since the distance from trailhead to destination is about 4.5 miles compared to the two miles to get to Avalanche Lake. Some of the users also may choose to head to Ptarmigan tunnel via the junction along the Iceberg trail, which would require a significant portion of the day. The volume of hikers on the Iceberg trail are not as numerous as the Avalanche Lake trail, but has more hiker density than most of the trails in the park (J. Potter, personal communication, April 27, 2011).

A convenience sampling method was utilized to allow the researcher to sample backcountry day users who were present at the sampling site. This strategy allowed the researcher to determine if the hiker was a day user rather than an overnight user, as well as ensure the participant was eighteen years or older. Hikers were approached and asked if they would like to complete a survey regarding their bear safety information. If interested, they were informed of what the survey entailed. Before they were given the survey, the researcher verbally affirmed that they were indeed backcountry day users and over the age of 18. Participants were told to read the directions and complete the sections accordingly. Clarifications about the question were given if asked. Participants were also instructed to answer the 'I don't know' response within the quiz section if they were not certain of an answer. Further, sharing quiz answers with other participants was not allowed. If there was a group of backcountry day users, multiple members were offered the survey. This was to insure a valid sample because past studies have shown that less experienced backcountry travelers rely on more experienced individuals as sources of information (Ramthun, 1998). Employees of the park were excluded from the study since they were engaging in work-related activities and were not considered park visitors.

### **Research Instrument**

This study included the development of an on-site survey (see appendix), which had three main sections:

- (1) A selection of questions was used to determine which of the backcountry day user's information sources were utilized for bear safety knowledge. The selection options differentiated between in-park and unaffiliated park sources, and type of

communication channel (mass-media, interpersonal). Questions asking perceived perception of knowledge as well as time of knowledge seeking were also included. The question format included multiple options (selecting all that apply) and a section ranking sources from most to least used.

- (2) A 'quiz' asked selected bear safety information questions in order to determine the backcountry day user's actual knowledge level. The questions were created by using GNP provided information about bear safety. Information that was primarily directed toward overnight users (e.g. food storage) was not included. Clarifications on the bear safety information were directed towards GNP's bear biologist John Waller (personal communication, July 7, 2011) and Chris Servheen, the Grizzly Bear Recovery Coordinator for the U.S. Fish and Wildlife Service (personal communication, June 27, 2011). Through these sources a list of the most important bear safety information pertaining to backcountry day users was obtained. This mixed method of question acquisition was used since there are occasional disagreements in expert opinion of proper behaviors in certain situations (Brown and Conover, 2008). The inclusion of a quiz section within a survey is consistent with previous studies that sought to determine visitor knowledge (Fazio, 1979; Cole et al., 1997; Manning, 2003; Dunn, Elwell, & Tunberg, 2008). A multiple choice and true-false answer format was used for this section.
- (3) Select socio-demographic, trip characteristic, and visitation characteristic questions were also asked. This section was included in order to obtain user information that could potentially be a contributing factor in information source



selection as well as knowledge. This is consistent with previous leisure related research which have examined variables such as age, education, gender, skill, and experience, and frequency of participation in relation to information sources and overall participation (Ewert & Hollenhorst, 1989; Shuett, 1993)

### **Response Rate**

Backcountry day users at Avalanche Lake were approached during their rest while viewing the lake and asked to participate in the study. At this location, 290 surveys were completed with only 4 rejections, resulting in a nearly 99 percent response rate. Backcountry day users on the Iceberg Lake trail were approached as they passed by the survey area. The total amount of surveys completed in this area was 262. There were a total of 6 refusals which resulted in a 98 percent response rate. A total of 552 surveys were collected.

### **Analysis**

The data were analyzed using the SPSS software. Descriptive statistical analysis was used to examine the questions. Frequencies were utilized to provide general response trends for demographics, trip information, recreation habits, and bear safety knowledge related questions. Independent T-tests were utilized to compare mean scores between specific responses to multiple questions. The one-way ANOVA test was used to analyze means between quiz score and bear safety information source used, as well as analyses comparing score to various demographic, trip, and recreation behavior related responses in the questionnaire. Bonferroni post-hoc tests were also conducted in each ANOVA test.

A point system was associated with the responses within the quiz section of the questionnaire which allowed for an overall 'score' of the quiz from each respondent. The point system was designed in a manner that each possible correct response in the quiz was worth one point. Total possible points for the quiz was 14, hence a perfect score was 14 points. An example of determining a score is a person with 9 correct responses and 5 incorrect responses results in a score of 9. So, each correct response was worth 1 point.

There were instances of missing data and surveys were removed to enable maximum validity of the responses. The paper survey given to the respondents on location had two sides. There were instances in which the respondents did not fill out page two of the survey for reasons such as time constraint or just because they were not aware there was a second side. These occurrences were minimal. These surveys were not included in the analyses because a portion of the second page included the bear safety quiz. In order to get a valid quiz score, the entire quiz must have been completed. Respondents were encouraged not to leave the question they did not know blank, and an 'I don't know' option was included in every quiz question. Assuming that a blank question equated to not knowing the answer would have decreased validity. An accurate representation of bear safety knowledge through quiz score was an integral component of the study. Therefore every survey that had even one quiz question left blank was removed from the analyses. The total number of surveys used for the score analysis was 516.

Errors in the completion of the questions asking the respondent to rank information sources also resulted in the removal of applicable surveys from analysis. The

respondents were asked to rank their bear safety information sources from most to least used by marking a number one next to the most used source, a number two for second most used and so on. There were instances where the respondent made only a marking next to sources that were used and failed to rank them. Surveys that did not have a ranking were excluded from the analysis since the ranking of bear safety information sources is an essential element of the study. The total amount of surveys used for source ranking analysis was 467.

A certain amount of grouping response categories was conducted in order to make some analyses possible to perform. The grouping also simplified the data in cases of which there were a multitude of responses. Grouping was performed in the listing of the respondent's most used source. The category 'Other sources' includes internet websites, television, newspapers/magazines, guided tours, and other. This was performed because these categories had been selected considerably fewer times than the sources that were left out. The high selection rate of the main sources necessitated their separation.

## CHAPTER 4: RESULTS

The results are organized by first identifying the general demographics of the survey participants, followed by information of the respondents' bear safety knowledge, recreation habits, and trip characteristics. Finally, the results of the analysis pertaining to each of the study's research questions are presented.

### **Demographics**

In order to create a generalized identification of the backcountry day users within GNP, a presentation of the demographic data follows (Table 1). The age range of the backcountry day users who participated in the survey was 18-82 years. The minimum age to participate in the survey was 18. The mean age was 47.4 years. The most frequent age range of backcountry day users was 51-65 with 203 individuals falling within this range. Over 50 percent of the respondents were males (53%), while 47 percent were females (Table 1). Forty-one states and 11 countries were represented within the sample. Of the respondents, 15 percent were residents of Montana (Table 1). This was followed by 8 percent each from Canada and California then 5 percent from Illinois and Minnesota. Thirty eight states were also represented that each made up less than five percent of the total sample. Respondents with a bachelor's degree being their highest level of education made up the largest portion of the sample with 33 percent (Table 1). Twenty-six percent had a master's degree as their highest education, followed by 23 percent with some college or less. Respondents with a doctoral or professional degree made up 19 percent of the sample.

**Table 1: Demographics**

<b>Gender</b>	<b>N</b>	<b>%</b>
Male	283	53%
Female	255	47%
<b>Age (mean 47.4)</b>		
18-30	111	21%
31-50	167	31%
51-65	203	38%
65-82	60	11%
<b>Residence of Respondents</b>		
Montana	83	15%
Canada	46	8%
California	41	8%
Illinois	29	5%
Minnesota	25	5%
All other states with 4% or less: <i>CO, FL, OR, WI, WA, TX, NC, MI, GA, MA, UT, AL, AZ, AR, CT, ID, IN, IA, KS, KY, MD, MO, NE, NJ, NM, NY, ND, OK, PA, SC, SD, TN, VA, DC, WY</i>	345	55%
Overseas: <i>Australia, Belgium, China, England, France, Netherlands, South Korea, Switzerland, Turkey</i>	19	4%
<b>Education</b>		
Some college or Less	123	23%
Bachelor's	182	33%
Master's	139	26%
Doctoral or professional	101	19%

### **Trip information, recreation habits, and bear safety knowledge**

The mean group size of backcountry day hikers was 4.47 with a group range of 1 to 33 (Table 2). Groups of two people comprised 33 percent of the total responses, almost 3 times as frequent as any other group size. Nearly half of the respondents indicated they were carrying bear spray (46%), or 248 out of the 544 respondents (Table 2). When asked about the amount of people carrying bear spray within their group, 43 percent said that there were none while 57 percent indicated that there were one or more

(Table 2). The mean number of people carrying bear spray per group was 1.16. Sixty-three percent of the respondents reported that it was their first time ever visiting GNP (Table 2). Thirty seven percent indicated they had visited the park at least twice. Over half (57%) of the respondents indicated they have hiked in grizzly populated areas less than 5 times in the past 10 years (Table 2). Seventeen percent signified they have hiked in these areas 5-10 times in the last 10 years while 26 percent of the respondents stated they have hiked in these areas more than 10 times in the past 10 years. Forty percent of the respondents stated that at some point in their lives, they have resided in an area where bears live nearby (Table 2). Participants were asked how comfortable they were hiking in a bear inhabited area. Just over half (51%) responded they were fairly comfortable (Table 2). Twenty-nine percent are very comfortable, 18 percent were slightly comfortable and just 3 percent responded not at all comfortable. When asked to assess their own knowledge of hiking safely in bear country, just under half (49%) believed they were fairly knowledgeable (Table 2). Thirty-two percent believed they were slightly knowledgeable, 18 percent responded they were very knowledgeable, and just 1 percent claimed they were not at all knowledgeable. Nineteen percent of the respondents stated they are dependent on another group member's knowledge of hiking in bear country.

**Table 2: Trip Information, Recreation Habits, and Bear Safety Knowledge**

<b>Hiking Group Size (Mean 4.47)</b>	<b>N</b>	<b>%</b>
<b>Carrying Bear spray</b>		
Yes	248	46%
No	296	54%
<b>Bear Spray Carriers in Hiking Group (Mean 1.16)</b>		
None	231	43%
One or more	312	57%
<b>Times visited Glacier National Park including this trip</b>		
One	339	63%
Two or more	199	37%
<b>Times hiked in grizzly populated areas in the past 10 years</b>		
Less than 5 times	307	57%
5-10 times	92	17%
More than 10 times	143	26%
<b>Have resided in an area where bears lived nearby</b>		
Yes	216	40%
No	324	60%
<b>Level of comfort while hiking in bear inhabited area</b>		
Not at all comfortable	15	3%
Slightly comfortable	96	18%
Fairly comfortable	275	51%
Very comfortable	157	29%
<b>Perceived self-knowledge of hiking safely in bear country</b>		
Not at all knowledgeable	7	1%
Slightly knowledgeable	172	32%
Fairly knowledgeable	263	49%
Very knowledgeable	98	18%
<b>Dependent on other's knowledge of hiking in bear country</b>		
Yes	104	19%
No	436	81%

**Research Question 1: Do Glacier National Park backcountry day users actively seek out bear safety information?**

Survey participants were asked when they had actively sought out bear safety information. Ten percent of the respondents stated they had never sought out bear safety information while 43 percent claimed to have sought the information before past trips

(Table 3). Thirty-six percent stated they had sought the information before their current trip to GNP. Twelve percent responded that they only sought out bear safety information once they arrived at GNP.

**Table 3: Timeframe of when Bear Safety Information was Actively Sought**

	N	%
Before past trips	228	43%
Before this trip	193	36%
When I reached Glacier National Park	63	12%
Never	53	10%

**Research Question 2: What is the Glacier National Park backcountry day user’s knowledge of correct bear safety information?**

The survey involved a quiz section that used the information about bear safety provided by GNP. Multiple choice and true/false questions were created for the quiz. A score of 14 points indicated perfect knowledge about bear safety. A grouping of scores was created which ordered scores from best to worst (Table 4). The mean score of all respondents was 9.7. In nearly a bell curve shape, 14 percent were in the top tier, 29 percent were in the second tier, 27 percent were in the third, 12 percent in the fourth, and 19 percent were in the lowest scoring category (Table 4).

Table 5 presents the response distribution of the true/false questions given within the bear safety quiz section of the survey. For the most part, respondents answered these questions correctly with the exception of two. First, 38 percent of the respondents did not choose the correct answer to the statement about the effectiveness of clapping hands as compared to bear bells. Of those who did not choose the correct answer, the majority indicated they did not know the correct answer. Second, 38 percent of the respondents



did not choose the correct answer to the statement about standing your ground if charged by a bear. The majority of those who did not choose the correct answer had chosen wrong, rather than indicating they did not know. Participants were given a specific physical characteristic of a bear and were instructed to indicate which species the characteristic applied to. Thirty percent of respondents did not choose the correct response when instructed to choose which bear species had brown fur (Table 6). Of these respondents, most had chosen the wrong answer as opposed to indicating they did not know. The majority of the respondents (87%) knew which species has a large hump of heavy muscle above the shoulders (Table 6). Thirty-one percent indicated they did not know which species had a dished-in face (Table 6). A total of 45 percent did not choose the correct answer to this question. Respondents were given a point for each correct selection of bear behaviors that indicate aggression. For each response, nearly half of the respondents failed to earn a point (Table 7). Sixteen percent of the respondents indicated they did not know the indicators of aggression. Most of the participants answered the two situational bear encounter questions correctly with a correct response rate of over 80 percent for each (Table 8).

**Table 4: Bear Safety Quiz Scores**

	<b>Mean 9.7</b>	
<b>Score Distribution</b>	<b>N</b>	<b>%</b>
(13-14 pts.)	71	14%
(11-12 pts.)	148	29%
(9-10 pts.)	140	27%
(8 pts.)	60	12%
(0-7 pts.)	97	19%

**Table 5: Response Distribution of True/False Quiz Questions**

	<b>N</b>	<b>%</b>
<b>Clapping your hands every few minutes is more effective than bear bells to avoid surprising bears</b>		
True*	321	62%
False	45	9%
I Don't Know	150	29%
<b>It is acceptable to get closer to a bear as long as you stay 100 feet from it</b>		
True	8	2%
False*	472	92%
I Don't Know	36	7%
<b>Bear spray can be used as a repellent by spraying it on your gear and equipment</b>		
True	16	3%
False*	451	87%
I Don't Know	49	10%
<b>If a bear charges you, you should stand your ground</b>		
True *	319	62%
False	165	26%
I Don't Know	62	12%
<b>Bears may interpret direct eye contact as threatening</b>		
True *	417	81%
False	26	5%
I Don't Know	73	14%

\*Reflects correct answer to statement

**Table 6: Response Distribution of Bear Characteristic Quiz Questions**

Select the bear species that may have the specific physical characteristic given	N	%
<b>Brown Fur</b>		
Black Bear	11	2%
Grizzly Bear	115	22%
Both Black and Grizzly Bears*	371	72%
I don't know	19	4%
<b>A large hump of heavy muscle above the shoulders</b>		
Black Bear	10	2%
Grizzly Bear*	449	87%
Both Black and Grizzly Bears	5	1%
I don't know	52	10%
<b>A dished-in face (slight scoop from forehead to tip of the nose)</b>		
Black Bear	64	12%
Grizzly Bear*	286	55%
Both Black and Grizzly Bears	8	2%
I don't know	158	31%

\*Reflects correct answer

**Table 7: Response Distribution of Aggression Indicator Quiz Questions**

Select which bear behaviors indicate aggression (choose all that apply)	N	%
Swaying their heads low*	295	57%
Standing on hind legs	268	52%
Clacking their teeth*	249	48%
Ears laid flat against head*	272	53%
I don't know	80	16%

\*Reflects correct answer

**Table 8: Response Distribution of Situational Quiz Questions**

	N	%
<b>You surprise a bear on the trail. It has charged and begins to attack. You don't have time to get to your bear spray. What should you do? (Choose only one)</b>		
Play Dead by laying on your stomach with your hands covering your neck*	422	82%
Fight back using anything you can	19	4%
Quickly find and climb the nearest tree	5	1%
Yell and scream as loud as you can to intimidate the bear	49	10%
I don't know	21	4%
<b>You turn a corner and see a bear on the trail 100 feet ahead. The bear notices you but appears unconcerned of your presence. What should you do? (Choose only one)</b>		
Turn around and walk away before it gets agitated	49	10%
Hide behind the nearest cover until it goes away	4	1%
Back away slowly until the bear is a safe distance away*	434	84%
Stomp your feet, yell, wave your arms and throw things until it leaves	9	2%
I don't know	20	4%

\*Reflects correct answer

### **Research Question 3: Which Glacier National Park source for bear safety information is most utilized by backcountry day users?**

Participants were asked to select all types of GNP sources they used to obtain information about bear safety knowledge. The most used source was park signage with 61 percent of the participants stating they used signs (Table 9). The second most used information type was pamphlets and/or brochures with 58 percent. The third most selected source was the park provided newspaper which has bear safety section. The GNP website, visitor's center employees, and ranger talks had similar amount of utilization by the backcountry day users with 31, 34, and 27 percent respectively.

**Table 9: Glacier National Park Sources Used to Acquire Knowledge**

	N	%
Park signage	331	61%
Pamphlets and/or brochures	316	58%
Newspaper	221	41%
Visitor's center employees	182	34%
Website	168	31%
Ranger talks	147	27%
None	73	14%
Hotel, restaurant, and store employees in the park	62	12%
Backcountry instructional video	48	9%
Other	25	5%
Facebook page	14	3%

**Research Question 4: Which source for bear safety information is most utilized by visitors including outside sources?**

In order to determine which bear safety information source was being most utilized overall, GNP provided information was placed into one category: GNP website and in-park information. The other categories were groupings of other off-site sources not associated with GNP. The most utilized sources remained their own category and those that were the primary sources for less than 10 percent of the respondents were grouped into one category. This category included internet websites, television, newspapers/magazines, guidebooks, guided tours, and other, which was an open-ended category. The results present the responses of the participants when asked to indicate their most used source to acquire bear safety knowledge.

Glacier Park information was the selected as the primary source by 37 percent of the respondents (Table 10). Seventeen percent of the respondents used other parks' information as their primary source. Family and friends were selected by 16 percent of the participants, and guidebooks were selected by 10 percent. The other source category

is a grouping of multiple sources that were mentioned less than 10 percent of the time. The aggregate of this source grouping made up 20 percent of the respondents' primary sources.

**Table 10: Backcountry Day User's Most Used Source**

	N	%
Glacier National Park website and in-park information	164	37%
Other parks	77	17%
Family and friends	70	16%
Guidebooks	44	10%
Other sources -Internet websites -Television -Newspapers/Magazines -Guided Tours -Other	87	20%

**Research Question 5: Are there differences in knowledge score depending on information sources used?**

A one-way ANOVA was performed using respondent quiz scores and the most used source for acquiring bear safety knowledge. Results showed there was a significant difference between scores and source (Table 11).

**Table 11: Score Difference between Sources**

Most used source	N	Mean Score	Standard Deviation	Standard Error	Between Groups Significance
GNP website and in-park information	164	9.8	2.35	.18	.028*
Other parks	77	10.2	2.16	.25	
Family and friends	70	8.9	2.75	.33	
Guidebook	44	9.6	2.54	.38	
Other sources	87	9.7	2.65	.28	

\*p=.05

Further analysis using a Bonferroni post hoc test showed that people who used information from other parks were significantly different than those who used family and friends ( $p < .018$ ). No other differences between sources used were statistically significant.

**Research Question 6: Are there any differences between backcountry day user demographics/trip recreation characteristics and knowledge of bear safety?**

T-tests were used to analyze differences in bear knowledge score and demographic or trip characteristics on dichotomous variables (Table 12). One-way analysis of variance (ANOVA) was used on variables with multiple options.

**Table 12: T-tests of Recreation Characteristics/Demographics and Mean Score Comparison**

<b>Resided in an area where bears live nearby</b>	<b>N</b>	<b>Mean Score</b>	<b>F</b>	<b>Sig.</b>
Yes	201	10.4	7.2	.008*
No	310	9.2		
<b>Relies on another group member's bear knowledge</b>				
Yes	97	8.5	1.8	.186
No	414	10		
<b>Times visited Glacier National Park</b>				
One	320	9.3	7.3	.007*
Two or more	189	10.4		
<b>People in groups with or without bear spray</b>				
No members with bear spray	218	8.9	4.7	.031*
Two or more	189	10.4		
<b>Carrying bear spray</b>				
Yes	234	10.5	7.1	.008*
No	281	9.1		
<b>Glacier National Park Hiking Location</b>				
Avalanche Lake trail	267	9.4	2.7	.017*
Iceberg Lake trail	249	10		

\* $p = .05$

Using ANOVA, differences between bear safety information sources and quiz scores were determined. Respondents who never sought out bear safety information had the lowest mean score of 8 (Table 13). Respondents who sought out information when they reached GNP had a mean score of 8.9. Those who sought out information before their current trip had a mean score of 9.7. Lastly, respondents who sought out information before past trips had the highest average score with 10.3. These score differences were statistically significant with a significance level of  $p < .000$  and an F-score of 16.3. A Bonferroni post-hoc test showed statistical significance between before past trips and each other response. Further, there was statistical significance found between 'before this trip' and 'never'.

Tests reported a statistical significance ( $p < .000$ ) between respondent quiz score and the number of times they have hiked in grizzly bear populated areas (Table 13). Those who have hiked 5 to 10 times had the highest average score with 10 points. The next highest scoring group is those who hiked more than 10 times with an average of 9.7 points. The lowest scoring group is those who had hiked less than 5 times with an average of 9.2 points. A Bonferroni post-hoc test indicated statistical significance between the groups except between 5-10 times and more than 10 times.

A statistical significance ( $p < .000$ ) was found between quiz score and comfortableness of hiking in bear inhabited areas (Table 13). The ANOVA test indicated that higher comfortableness levels were related to higher mean quiz scores. As shown, the group with the lowest mean score was not at all comfortable hiking in bear inhabited areas. The group with the highest mean score was respondents who were very



comfortable hiking in bear inhabited areas. The Bonferroni post-hoc test results showed statistically significant differences of the scores between the very comfortable group and each other group.

An ANOVA comparing quiz score means of different age groups indicated a statistically significant ( $p < .010$ ) difference (Table 13). The 31-50, 51-65, and 65+ age groups had similar mean scores. However, the 18-30 age group had an average mean score of nearly one point less than the other age groups.

One-way ANOVA results showed a significance difference ( $p < .000$ ) between mean quiz score and perceived knowledge of hiking safely in bear country (Table 13). Respondents who had a lower level of self perceived knowledge on average had a lower score than those who selected a higher self perceived knowledge category. Those who selected very knowledgeable scored 4 points higher on average than not at all knowledgeable, 2.7 points higher than slightly knowledgeable, and 0.8 points higher than fairly knowledgeable. Bonferroni post-hoc test results indicate significance between each response type except between not at all knowledgeable and slightly knowledgeable.

A significant difference between score and education was found. The statistical significance between groups was  $p < .016$  (Table 13). A Bonferroni post-hoc test indicated that people with a highest education of a bachelor's scored on average .87 points better than people with a highest education of a master's degree with a statistical significance of .017. All other score differences between each education level had no significance found.

**Table 13: ANOVAs of Recreation Characteristics/Demographics and Mean Score Comparison**

<b>When bear information was sought</b>	<b>N</b>	<b>Mean Score</b>	<b>Standard Deviation</b>	<b>Standard Error</b>	<b>Between Groups Significance</b>
Never	51	8	2.4	.22	.000*
Before past trips	215	10.3	2.3	.17	
Before this trip	182	9.7	2.8	.25	
When I reached Glacier	60	8.9	2.6	.26	
<b>Times hiked in a grizzly bear area</b>					
Less than 5 times	291	9.2	2.6	.15	.000*
5-10 times	89	10	2.2	.24	
More than 10 times	133	9.7	2.1	.18	
<b>Level of Comfort hiking in bear country</b>					
Not at all comfortable	15	8.3	3.0	.78	.000*
Slightly comfortable	92	8.9	2.9	.30	
Fairly comfortable	261	9.6	2.3	.14	
Very comfortable	146	10.5	2.4	.20	
<b>Perceived Knowledge</b>					
Not at all knowledgeable	7	6.1	3.8	1.4	.010*
Slightly knowledgeable	164	8.3	2.7	.21	
Fairly knowledgeable	249	10.2	2.0	.13	
Very knowledgeable	90	11	1.9	.20	
<b>Age Group</b>					
18-30	107	8.9	2.5	.24	.010*
31-50	160	9.9	2.5	.20	
51-65	190	9.9	2.5	.18	
65+	56	9.8	2.4	.32	
<b>Education</b>					
Some college or less	117	9.5	2.4	.22	.016*
Bachelor's	171	10	2.3	.17	
Master's	131	9.2	2.8	.25	
Doctoral or Professional	97	9.9	2.6	.26	

\*p=.05

## **CHAPTER 5: DISCUSSION, MANAGEMENT IMPLICATION, AND CONCLUSIONS**

The following section discusses the findings of the study, identifies specific management implications derived from the results, and ends with the overall conclusions.

### **Research Question 1: Do Glacier National Park backcountry day users actively seek out bear safety information?**

A survey question asked when the respondent had actively sought out information about hiking in bear country. While results show that most had sought out information, there was a small group of respondents that had never actively sought out bear safety information; meaning that they have either never acquired bear safety knowledge, or have only acquired knowledge through seeking-orienting information behaviors. Almost half of the respondents reported that they actively sought information before past trips. It can be inferred that these backcountry day users did not seek out information for their most recent GNP visitation. The reasons for this are unknown; however possible explanations may be time constraint, amount of effort required, or the individual deemed their previous information search sufficient to meet their desired bear safety knowledge level. Over a third of the respondents had sought out information prior to their current GNP trip. These backcountry day users sought bear safety information to prepare for their trip into bear inhabited areas, indicating active information seeking behavior described by Wilson (2000). Twelve percent indicated they had sought bear safety information only when they reached GNP. This suggests that these respondents did not engage in any active bear safety information search prior to their arrival at the park, and therefore utilized only park provided bear safety material. Overall, most respondents did perform

an active bear safety information search to some degree. The majority of these respondents actively searched prior to a trip they took.

Quiz score mean differences were found to be related to when information was sought. The highest scoring respondents were those who had actively sought information before past trips. Respondents who sought information before their most recent trip, during their visit to GNP, or never at all have a lower overall knowledge level of bear safety when compared to those who sought information before past trips. There was no statistically significant difference in scores between respondents who sought information when they reached the park, and those who had never sought bear information. This finding suggests that those not actively seeking information prior to their GNP trip are not likely to acquire a significant amount of knowledge from park provided materials.

**Research Question 2: What is the Glacier National Park backcountry day user's knowledge of correct bear safety information?**

A quiz was implemented within the survey to assess the overall bear safety knowledge of the backcountry day users who participated in the study. Bear safety questions were created by using the GNP provided information and rewording them into question form. The total possible points a respondent could receive was 14, which is a perfect score. Within the possible responses, there was always an 'I don't know' option available. If this response was selected, no points were given. As the results showed, the mean score of the respondents was 9.7; meaning that on average the respondents were incorrect on over a third of the questions. A scoring categorization was created to gain a better understanding of the score distribution. Generally, the majority of the respondents

had a moderate degree of bear safety knowledge. However, nearly 20 percent of the respondents answered less than half of the questions correctly which indicates a very low knowledge level. This suggests there is a gap in the knowledge of many backcountry day users. So, even though backcountry day users on average have a moderate level of knowledge overall, one fifth of the sample has minimal understanding of bear safety practices. This can potentially increase their risk of harm while hiking in bear inhabited areas (Herrero, Smith, DeBruyn, Gunther, & Matt, 2005). The number of uninformed respondents supports McCaffrey's (2004) finding that the public often have low salience of natural hazards such as bear encounters.

The survey location within the park was compared to scoring trends. The Avalanche Lake trail is noted for being a very short hike with extremely high foot traffic and a moderate bear density in the area. The Iceberg Lake trail is a longer hike, has slightly less foot traffic than Avalanche, and has a high bear density in the surrounding area. Overall, respondents surveyed on the Iceberg Lake trail received higher grades than the average respondent score, and respondents surveyed on the Avalanche Lake trail scored lower than the average respondent. This suggests that people hiking in riskier areas tend to have an increased knowledge of hiking safely in bear country. It is uncertain whether the backcountry day users researched more because they were planning to hike in this area, or they hiked in this area because they felt they were already knowledgeable about bear safety. The former possibility is supported by Strating, Van Beuningen, Kuttschreuter, and Gutteling's (2004) finding of a positive relationship between risk perception and perceived information needs. Either way, this evidence

supports that there is some relationship between the type of backcountry day use area and the user's bear safety knowledge.

There were certain questions on the quiz that respondents commonly did not receive a point (either by answering incorrectly or selecting the 'I don't know' response). Nearly 40 percent of the respondents did not receive a point from the question that asked whether clapping your hands every few minutes is more effective than bear bells to avoid surprising bears. Almost 30 percent of the respondents indicated that they did not know the answer, which suggests a lack of information available about this topic. Another question often missed asked if the person should stand their ground if a bear charges. Nearly 40 percent of the respondents did not receive a point for this question, 25 percent whom answered incorrectly and 15 percent indicating that they didn't know. This high percentage may be due to different recommendations. Differences in behavior recommendations can depend on geographic location bear species, and specific situation (Brown & Conover, 2008). Forty-five percent of the respondents did not receive points when asked to identify which bear species has a dished-in face. The term dished-in face was taken from GNP provided material and clarification of meaning often had to be provided during the survey process. In a 'select all that apply' question asking the respondent to identify behaviors that indicate aggression, a point was given to each correct answer. On every response within this question, nearly half of the respondents failed to earn points. This indicates an overall lack of knowledge of this specific bear safety topic.

**Research Question 3: Which Glacier National Park source for bear safety information is most utilized by backcountry day users?**

A section within the survey asked the respondent to select which GNP provided bear safety information methods they have ever used. The term ‘used’ was included to incite the participants to select only the information that they have actually looked at and studied, as opposed to the ones they just received or to which they were exposed. Respondents were given a listing of various methods the park uses to provide visitors with bear safety information. The respondents were instructed to select all that applied, allowing for more than one to be chosen. This question design discerns which information transfer method is most popularly used by the respondents as a whole. However, it does not elucidate which park information transfer method is considered by the respondents as their primary source. So, these results indicate common use and do not divulge how much each source was utilized.

Sixty-one percent of the respondents marked that they had used park signage. Since the respondents were all backcountry day users this indicates that signage is having its intended effect of providing onsite information. However, the extent of use is unknown. The park newspaper as well as pamphlets was also used by a significant percent of the respondents, 41 and 58 percent respectively. These sources have the most detailed text-based bear safety information that is available within GNP. Both of these sources are available at the visitor centers, park entrances, and some information kiosks. These high percentages indicate that around half of the backcountry day users utilized at least one source that can be kept on hand throughout the duration of their visit. Visitor center employees and ranger talks were also commonly used, with 34 and 27 percent of

respondents indicating them as a utilized source, respectively. These are the most prevalent interpersonal sources the park provides which allows for dynamic question-answer interactions. Finally, websites were reported as commonly used, with 31 percent of the respondents indicating its use. This source is unique in that it is accessible anywhere there is internet access. It has a large amount of detailed bear safety information and allows the backcountry day user to gain bear safety knowledge during the trip planning stage. The website is the source that most indicates an active bear safety information search as part of the trip planning.

Overall, the most commonly used sources are text base, which are easily available to the backcountry day users. Park signage is most often placed in high foot traffic areas such as trailheads and parking lots. The park newspaper and pamphlets are given to the visitor at entrances and are available at various locations. Interpersonal sources were used to a lesser degree; however research indicates that these source types have a higher amount of influencing knowledge acquisition (Rogers, 2003). The amount the park website was used indicates that a substantial amount of the backcountry day users who sought out information prior to their trip used a GNP provided source.

**Research Question 4: Which source for bear safety information is most utilized by visitors including outside sources?**

GNP provided sources were the most used, which suggests that a significant amount of backcountry day users are either specifically seeking out park provided material, or they acquired the bulk of their knowledge during a trip to the park. GNP provided primary information was used more than twice as often as any other source.



Sixteen percent of the respondents indicated that family and friends were their primary source. This source type may vary in accuracy specifically due to the prevalence of conveying either misinformation or outdated information (Rogers, 2003). An analysis of the knowledge level of those who utilized this source is described in research question 5. Fourteen percent of the respondents named other parks as their primary source. This indicated that the respondents likely sought out information either prior to other trips, or acquired bear safety knowledge at a different park during their current trip. For example, if an individual has multiple destinations within their current trip, they may have visited Yellowstone National Park and acquired bear safety knowledge from their bear safety program prior to their arrival at GNP. Ten percent of the respondents named guidebooks as their primary source. This source is quite generalized since the guidebook may not be specifically about bears. Books with multiple topics may fall into this category. For example, a guidebook that gives general information about GNP would fall into this category because it is not created and provided by GNP.

**Research Question 5: Are there differences in knowledge score depending on information sources used?**

The mean scores of each primary source category were determined and a statistical significance was found. The GNP website and in-park information, guidebook, and other sources categories all had similar mean scores. These results not necessarily possess more correct bear safety knowledge. The mean scores within these categories were within 0.1 point of the average score of the entire study sample, indicating that these respondents generally did no better or worse than the average respondent. This is especially surprising for those who stated their primary source as

GNP information. Information from this source is known to be accurate and therefore provided the source user with the correct answers. Even so, there was no marked increase in mean score of these respondents. There is no evident explanation for this, and without additional information about respondent information acquisition habits any interpretation is only conjecture.

Interestingly, respondents who cited their primary source as other parks on average scored higher than those who had GNP information as their primary source. Though the score differences were not statistically significant, the results signified that respondents who used other parks as a primary source had at least as much knowledge as those within the GNP source category.

Out of all the primary source categories, family and friends had the worst respondent mean quiz score. On average, these respondents scored 0.8 points lower than the mean score of all respondents. However, the only statistical significance found was when compared to the group of respondents that indicated other parks as their primary source. It can then be inferred that backcountry day users who rely on family and friends on average have a lower amount of knowledge about hiking safely in GNP than those who primarily used sources from other parks. This supports the previous research conducted regarding the accuracy of information from family and friends (Dorman & Fridgen, 1982; Rogers, 2003).

**Research Question 6: Are there any differences between backcountry day user demographics/trip recreation characteristics and knowledge of bear safety?**

A series of statistical tests assessing quiz score differences between certain demographic, trip characteristic, and recreation habits were conducted. These results do not necessarily indicate a causality of the respondent's quiz score. They do however identify some type of connection between the backcountry day user's characteristics and their bear safety knowledge level.

A T-test was conducted between quiz score and whether the respondents had ever resided in an area where bears live nearby. Respondents that answered yes on average scored 1.2 points higher than respondents who answered no. This result may indicate that the presence of a bear population near an individual's residence enhances the individual's overall bear safety knowledge in some way. There is evidence of differences in score depending on the number of times the backcountry day user had visited GNP. Respondents who have visited the park at least twice scored on average 1.1 points higher than respondents that had only visited GNP once. This score difference shows that backcountry day users who have visited the park on multiple occasions acquire a higher level of bear safety knowledge. The increase in knowledge may be due to the knowledge acquired during their previous trip or trips to the park. This supposition cannot be assumed though, since knowledge acquisition may have come from information found between trips that were unrelated to GNP.

Respondents were asked two questions involving bear spray. The first question asked whether they were carrying bear spray. Those who answered yes had an average

score of 10.5 points on the quiz, 1.4 point higher than those who said no and 0.8 points higher than the mean score of all respondents. The second question asked whether anyone within the respondent's hiking group had bear spray. Respondent's who selected yes scored 1.5 points higher than those who selected no, and 0.7 points higher than the mean respondent score. These outcomes suggest that not only a person who carries bear spray have a higher score, but those who are just associated with a person carrying bear spray are more likely to have a higher quiz score. This obviously doesn't mean that more bear safety knowledge is gained when an individual or group member buys bear spray. It does suggest that a backcountry day user who deems bear spray as an advantageous tool for bear safety also knows more correct bear safety information than the average backcountry day user. The same supposition goes for those who are associated as group members of bear spray carriers.

Varying recreation characteristics were shown to be related to differences in mean scores. Respondents who have hiked in grizzly populated areas at least 5 times on average had a higher knowledge of bear safety than those who have hiked in these areas less than 5 times. The higher knowledge level of more seasoned hikers signifies that experience is a factor in the knowledge acquisition process. However, it cannot be inferred that the experience gained from hiking is the only causal factor that increases a person's knowledge. Other related factors may play a role. These may include an increase in bear safety information seeking, an information source horizon expansion, and experiential encounters during the hikes. The experience an individual has seems to some degree influence either active information seeking or seeking orienting information. Active information seeking behavior may occur if the individual identifies the need for

knowledge due to factors such as risk perception or an increased interest in the topic (Neuwirth, Dunwoody & Griffin, 2000; Strating, Van Beuningen, Kuttschreuter, & Gutteling, 2004). Seeking orienting information behaviors related to bear safety may occur because of the individual's openness to the information once initial bear safety levels have been established. Overall, it appears that frequently hiking in grizzly bear inhabited areas has an indirect causal relationship with increased bear safety knowledge.

Self perceived knowledge level was positively correlated with level of actual bear safety knowledge. Respondents were more likely to have a high actual knowledge level if they had a perceived knowledge level that is high. Conversely, those who had low perceived knowledge levels were more likely to have low actual knowledge levels. This positive correlation provides evidence that backcountry day users have a relatively accurate self perception of their bear safety knowledge level.

The respondent score means were found to have differences depending on certain demographic categorizations. Regarding highest education level, significant score difference were only found between the bachelor's and the master's degree categories. Surprisingly, the lowest scoring groups contained some of the more highly educated respondents. The master's degree group scored an average of 9.2 points which was 0.5 points lower than the average of all backcountry day users. Between groups, a significant difference was found between this master's group and the bachelor's degree group, which had an average quiz score of 10. Beside the difference between these two groups, no other group comparison resulted in a significant mean score difference. Additional

research would be required to elucidate why the master's degree group scored significantly lower than the bachelor's degree group.

In regards to score mean differences between age groups, the age group 18-30 had a lower average score than all the other age groups besides the 65+. Significance was not found when compared to the 65+ group likely due to this group's small sample size. The 18-30 age group had an average score of 8.9, which is 0.8 points lower than the entire sample average and nearly 1 point lower than the other age groups. This low score identifies an overall lack of bear safety knowledge when compared to other age groups. There could be a multitude of determinants that influenced this outcome. The relatively young age may correlate with lack of experience of hiking in bear inhabited areas. As discussed earlier, the amount of times a person has hiked in grizzly inhabited areas was found to be a significant factor in quiz score. This young age group may have hiked in these areas less than the other age groups. Another possibility is that bear information is not as common within this age group's information source horizons, thereby causing a reduction in bear safety information exposure. Additional information behavior and recreation characteristics are needed to make assertions about the causes behind the 18-30 year old group's score level.

### **Management Implications**

This study attempted to identify backcountry day user's information source use, bear safety knowledge level, and factors that influence or are associated with the knowledge level. In terms of GNP management, this study can be used as a resource in improving the effectiveness of the park's bear safety education program. As a baseline

study, it also supplied initial information of backcountry day user characteristics, knowledge, and behaviors that may affect their overall ability to hike safely within GNP. The study results provide a means to fine tune certain elements of the bear safety education program to maximize effectiveness in its implementation.

The findings of which sources were utilized provide a greater insight of the information behavior of the backcountry day users. The results show problems with GNP's bear information in that it has had limited success in instilling knowledge to those who use it. However, until further research can be conducted on dissemination method efficacy, the most used methods should continue to be implemented. In terms of in-park GNP provided sources, the popularity of the park signage encourages their continued use. The location of the signage provides last minute information accessibility and is effective in relaying short and to the point information to the backcountry day user right before their hike begins. Newspapers and pamphlets were also indicated as a commonly used means to gain bear safety knowledge. These information sources should continue to be promoted, and the existence of a bear safety information section within the paper should be emphasized to all visitors. Ranger talks and visitor's center employees should also be continued, as the respondents indicated these sources were often used.

The website is another source that was commonly used. As the most detailed and accessible park provided source, as well as the only park-provided source that can be accessed prior to visitation, the importance of maximizing the effectiveness of the website is paramount. Over a third of the respondents sought out information during the planning for their trip to GNP. This identifies the need for the park to provide easy

access to their bear content as well as website compatibility with all devices that can access the internet. Within the website, there should be minimal navigation through the pages to find the information. Ideally there should be a link to this information from the website's front page.

The bear safety quiz scores indicated that backcountry day users do not have an exceptionally high level of correct bear knowledge. As mentioned, the average respondent answered nearly one-third of the questions incorrectly. This result stresses the need for additional measures that influence backcountry day users to not only look over the information, but also commit it to memory. The acquisition of the knowledge has been shown to be a pertinent influencing factor to produce desired behaviors (Kellert, 1996; Kaiser & Fuhrer, 2003). The overall low score signifies that the backcountry day users have not entirely learned the information the park deems important. Though not every visitor is expected to know every piece of information, there were some questions respondents got incorrect more frequently than the rest.

Since the quiz questions were created based on GNP provided materials, common incorrect answers were used to identify bear safety information that backcountry day user's lacked in knowledge. Extra emphasis should be placed on the information that describes clapping hands as more effective than bear bells, a person should stand their ground if they are charged, the visual differentiation between black and grizzly bear, and bear behaviors that indicate aggression. This specific information was often not known by the backcountry day users, and the park can help resolve this absence of knowledge through increased education of these specific topics. Of these information topics, the



reiteration of standing ground upon a bear charge is of very high importance since knowledge of this fact can directly influence the chances of an attack. Further, the phrase 'stand your ground' was not always comprehended by the respondents, and sometimes interpreted as laying on the ground, squatting down, or backing away. Therefore a clarification of 'stand your ground' is recommended.

There were some issues with the knowledge level of respondents who used GNP provided information as their primary source. Statistically, these respondents did not have a higher level of bear safety knowledge than respondents who had a different primary source. This finding signifies that GNP information sources generally do not have any more power to influence knowledge acquisition than any other outside source. Though the park can only do so much to influence backcountry day users to gain knowledge from their information, the fact that the information provided is correct emphasizes the need to promote the material and make it easily available. Another potential reason the score level may have occurred is that within this category, there may have been backcountry day users who had never sought out information prior to arriving at Glacier. As a result, they may have no prior knowledge base. If a knowledge base prior to arrival at the park is an important factor in understanding in park bear safety materials, then the importance of providing easy online access to GNP bear safety information is paramount.

Certain trip characteristics, hiking habits, and demographics were found to be factors that have influence upon, or are associated with respondent knowledge level. An emphasis should be placed on educating people who are inexperienced in hiking in bear

inhabited areas. The age group of 18-30 was the least knowledgeable age group. One possible explanation is that these individuals are not as experienced in hiking in bear inhabited areas. Results indicated that backcountry day users who have hiked in grizzly bear areas less than 5 times had a lower mean score than those who had hiked more. The results also showed that first time visitors had significantly lower scores than repeat visitors. If the park developed a way to find out whether visitors are entering GNP for the first time and are planning on backcountry day hiking, then the employee could emphasize the availability and importance of bear safety information sources.

In addition, the results revealed that perceived knowledge level and degree of comfort hiking in bear country were both found to have strong positive correlations with actual knowledge level. If park employees determine the level of both of these categories for park visitors, they can also determine their level of bear safety knowledge. This can be utilized as an easy way to identify whether a day hiker may benefit from an additional supplement of bear safety information. If additional information is given in conjunction with a park employee emphasizing the importance of knowing the given information, an increase in average day user bear safety knowledge may be achieved.

## **Conclusions**

The purpose of this study was to identify bear safety information sources that backcountry day users utilized to acquire bear safety knowledge. The study also examined the overall bear safety knowledge level of these users and attempted to identify whether the use of certain information sources influenced knowledge level. The study contributed to the literature by identifying information behavior related to bear safety as

well as established the bear safety knowledge level of a specific National Park visitor type. Although there has been other research involving bear information use and knowledge, there are a limited amount of studies that analyze the connection between information source and knowledge level (Dunn et al. 2008). Certain components of the study's design were modeled after previous work involving visitor knowledge assessment and bear related information sources (Dunn et al., 2008). In terms of research within GNP, this study is the first of its kind.

The respondents of the study were backcountry day users within GNP. These are visitors who hike on the backcountry trails within the park but do not camp at the backcountry campgrounds. People within this user type are in the unique position of hiking in similar bear inhabited areas as overnight backcountry users but having no required education imposed on them. Backcountry day users are exposed to bear safety information on a voluntary basis, be it prior to their trip to GNP or during their visit. A concern identified prior to the study was that the backcountry day users may not be prepared with the knowledge for hiking safely in bear inhabited areas (J. Potter, personal communication, April 27, 2011). To gain a better understanding of backcountry day user information search and knowledge, a survey was implemented to identify source use habits and overall bear safety knowledge level.

The vast majority of the respondents claimed to have actively sought out bear safety information. This behavior suggests the respondents had identified an 'uncertainty' or 'gap' in their bear safety knowledge base and therefore engaged in active information seeking behavior as described by Wilson (2000). Overall, respondents used

GNP provided bear safety information more than any other information source indicating that park provided sources are within the majority of respondent's information source horizons. Of all the information types provided by the park, text based material (signs, pamphlets, newspaper) were found to be most highly utilized. Interpersonal communication methods (ranger talks, visitor's center employees) were also commonly used but to a lesser extent than text based information methods. Source types not provided by GNP that were declared as often used included family and friends, other parks, and guidebooks.

A baseline bear safety knowledge level of the respondents was found through a quiz based knowledge testing format. Of the hiking related bear safety information provided by the park, the backcountry day users who were sampled knew an average of 70 percent of the information that the GNP deems important. It is difficult to assess whether this is an acceptable knowledge level. This is the first study of its kind within GNP, and a target knowledge level has never been established by park management. However, common sense dictates that many hikers in GNP do not have enough knowledge about hiking safely in bear territory and therefore are more prone to encounters that will not turn out well for the human, the bear, or both.

To a certain extent knowledge level was also shown to be influenced by sources used. Surprisingly, respondents who stated that their primary information source was GNP provided information were not more likely to have better knowledge than any other respondent. In fact, the highest knowledge level was achieved by respondents in the source group that primarily used other park's information. This is an unexpected finding

and warrants a closer look at the effect frequency of participation and experience has on knowledge level.

This study has identified the need for additional research within this subject. A closer examination of what information was actively sought out and what was obtained through seeking-orienting information behaviors will provide valuable information to park management. In addition, a study that combines the research of information program assessment, research about influencing desired behavior change, and information behavior of bear safety information acquisition can maximize the success of imbuing bear safety knowledge into the desired user type.

In conclusion, understanding the current knowledge level and information seeking behaviors is a crucial aspect of visitor safety and bear management practices within GNP. A greater understanding of these aspects of backcountry day users assists in developing best practices of the bear safety education program and helps keep both the hiker and bear safe.

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**APPENDIX**

# Bear Safety Visitor Survey

1. How knowledgeable are you in regards to hiking safely in bear country?

- Not at all knowledgeable   
  Slightly knowledgeable   
  Fairly knowledgeable   
  Very knowledgeable

2. Please select which Glacier National Park provided bear safety information methods you have ever used. (Select ALL that apply)

- |   |  |
|---|--|
| <input type="checkbox"/> I have not obtained bear safety knowledge from Glacier National Park<br><input type="checkbox"/> Glacier National Park website<br><input type="checkbox"/> Glacier National Park's Facebook page<br><input type="checkbox"/> Glacier National Park visitor center employees<br><input type="checkbox"/> Ranger talks | <input type="checkbox"/> Glacier National Park newspaper<br><input type="checkbox"/> Backcountry instructional video<br><input type="checkbox"/> Signs in the park<br><input type="checkbox"/> Pamphlets/ brochures from Glacier<br><input type="checkbox"/> Hotel, restaurant, store employees in the park<br><input type="checkbox"/> Other (Please specify in the box below)<br><input style="width: 100%; height: 15px;" type="text"/> |
|---|--|

3. Other than Glacier National Park sources, where have you obtained your bear safety knowledge? (Select ALL that apply)

- |  |   |
|--|---|
| <input type="checkbox"/> I have not obtained knowledge about bear safety<br><input type="checkbox"/> Other national parks or public land agencies (state parks, forest service, etc.)<br><input type="checkbox"/> Television (documentaries, movies, TV shows, news)<br><input type="checkbox"/> Internet websites<br><input type="checkbox"/> Pamphlets/brochures | <input type="checkbox"/> Guide books<br><input type="checkbox"/> Family/friends<br><input type="checkbox"/> Newspapers/magazines<br><input type="checkbox"/> Social Media (example: Facebook)<br><input type="checkbox"/> Guided tours<br><input type="checkbox"/> Other (Please specify in the box below)<br><input style="width: 100%; height: 15px;" type="text"/> |
|--|---|

4. When did you actively seek out information about hiking in bear country?

- |   |   |
|---|---|
| <input type="checkbox"/> Never<br><input type="checkbox"/> When I reached Glacier National Park | <input type="checkbox"/> Before past trips<br><input type="checkbox"/> Before this trip |
|---|---|

5. Please rank the top information sources you have used for your bear safety knowledge (1= most used source, 2=second most used, etc.) Note: Mark only the sources that you have used

- |   |   |
|---|---|
| Glacier National Park website   | <input style="width: 50px; height: 20px;" type="text"/> |
| Glacier National Park in-park information                               | <input style="width: 50px; height: 20px;" type="text"/> |
| Other parks or public land agencies (state parks, forest service, etc.) | <input style="width: 50px; height: 20px;" type="text"/> |
| Family/Friends  | <input style="width: 50px; height: 20px;" type="text"/> |
| Internet websites (other than Glacier)                                  | <input style="width: 50px; height: 20px;" type="text"/> |
| Television (news, TV shows, documentaries, movies)                      | <input style="width: 50px; height: 20px;" type="text"/> |
| Newspapers/Magazines  | <input style="width: 50px; height: 20px;" type="text"/> |
| Guidebooks  | <input style="width: 50px; height: 20px;" type="text"/> |
| Guided Tours  | <input style="width: 50px; height: 20px;" type="text"/> |
| Other (please specify below)  | <input style="width: 50px; height: 20px;" type="text"/> |
| <input style="width: 250px; height: 20px;" type="text"/>                |   |

Choose whether the following statements are true or false. If you honestly don't know the answer, select "I don't know".

- |   |                               |                                |                                       |
|---|-------------------------------|--------------------------------|---------------------------------------|
| 6. Clapping your hands every few minutes is more effective than bear bells to avoid surprising bears. | <input type="checkbox"/> True | <input type="checkbox"/> False | <input type="checkbox"/> I don't know |
| 7. It is acceptable to get closer to a bear as long as you stay 100 feet from it.                     | <input type="checkbox"/> True | <input type="checkbox"/> False | <input type="checkbox"/> I don't know |
| 8. Bear spray can be used as a repellent by spraying it on your gear and equipment.                   | <input type="checkbox"/> True | <input type="checkbox"/> False | <input type="checkbox"/> I don't know |
| 9. If a bear charges you, you should stand your ground.   | <input type="checkbox"/> True | <input type="checkbox"/> False | <input type="checkbox"/> I don't know |
| 10. Bears may interpret direct eye contact as threatening.  | <input type="checkbox"/> True | <input type="checkbox"/> False | <input type="checkbox"/> I don't know |

In the following questions, a specific physical characteristic of a bear species is given. Select the bear species that may have that characteristic. If you honestly don't know the answer, select "I don't know".

11. Brown Fur

- Black Bear  
 Grizzly Bear

- Both Black and Grizzly bears  
 I don't know

12. A large hump of heavy muscle above the shoulders

- Black Bear  
 Grizzly Bear

- Both Black and Grizzly bears  
 I don't know

13. A dished-in face (slight scoop from forehead to tip of the nose)

- Black Bear  
 Grizzly Bear

- Both Black and Grizzly bears  
 I don't know

14. Select which bear behaviors indicate aggression (choose ALL that apply).

- Swaying their heads low  
 Standing on hind legs  
 Clacking their teeth

- Ears laid flat against head  
 I don't know

15. You surprise a bear on the trail. It has charged and it begins to attack. You don't have time to get to your bear spray. What should you do? (Choose only ONE)

- Play dead by laying on your stomach with your hands covering your neck  
 Fight back using anything you can  
 Quickly find and climb the nearest tree

- Yell and scream as loud as you can to intimidate the bear  
 I don't know

16. You turn a corner and see a bear on the trail 100 feet ahead. The bear notices you but appears unconcerned of your presence. What should you do? (Choose only ONE)

- Turn around and walk away before it gets agitated  
 Hide behind the nearest cover until it goes away  
 Back away slowly until the bear is a safe distance away

- Stomp your feet, yell, wave your arms and throw things until it leaves  
 I don't know

17. Including this trip, how many times have you visited Glacier National Park in the past 10 years?

18. How many times have you hiked in Grizzly bear populated areas in the past 10 years?

- Less than 5 times       5 - 10 times       More than 10 times

19. Have you ever resided in an area where bears lived nearby?  Yes  No

20. How comfortable are you hiking in a bear inhabited area today?

- Not at all comfortable       Slightly comfortable       Fairly comfortable       Very comfortable

21. How many people are with you in your hiking group?

22. Are you carrying bear spray on this hike?  Yes  No

23. How many in your hiking group are carrying bear spray today?

24. Within your hiking group, are you DEPENDENT on another person's knowledge of hiking in bear country?

- Yes  No

25. What is your age?

26. What state, province, or foreign country do you permanently reside?

27. What is your gender?  Male  Female

28. What is the highest level of formal education you have completed

- Less Than High School       2 Year College Degree (Associate)       Masters Degree  
 High School Graduate/GED       4 Year College Degree (Bachelor's)       Professional Degree  
 Some College       Doctoral Degree

Thank you for your participation!