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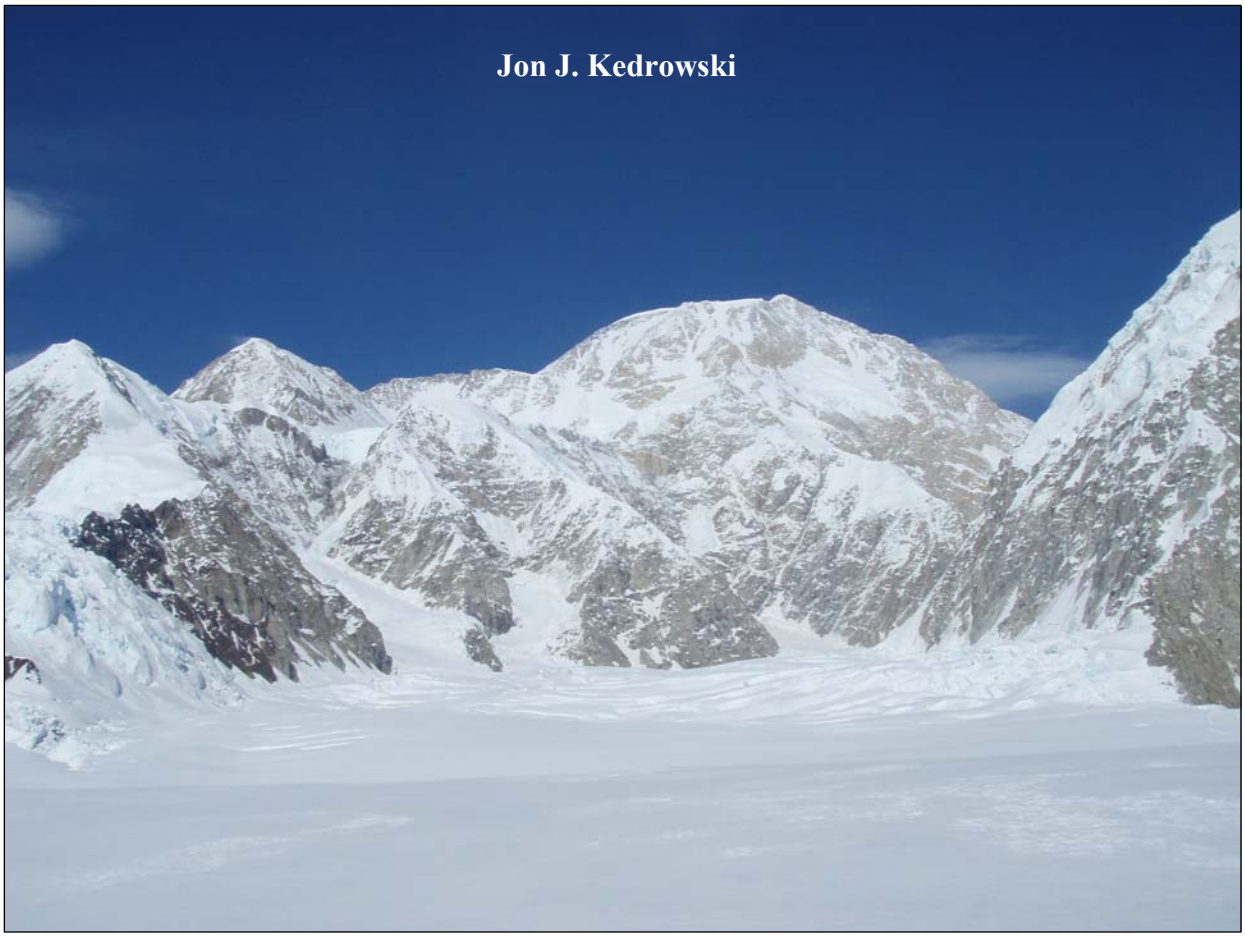
Climber's Perceptions on McKinley: Crowding Concerns, Hazards, and Climber Demographics



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Climber's Perceptions on Mount McKinley: Crowding Concerns, Hazards, and Climber Demographics

ABSTRACT

Limited data exist for Mount McKinley (Denali) addressing issues of climbers' success, environmental impacts to the peak, visitor experience, and crowding. Despite prior research, a need exists for more information regarding climbers' perception of risk and challenges, describing success for the typical climber, and further investigating if levels of crowding are within acceptable limits for the climbers present. The objective of investigating visitor experience and climbers' perception of risk on Mount McKinley was to develop new knowledge about the different demographic backgrounds, visitor experiences, and perception of inherent risks associated with a typical summit attempt of the highest mountain in North America. The project utilized a survey to gauge the overall impressions of an adequate random sample of Denali climbers from the Kahiltna basecamp at 7,200'/2195m. Preliminary results focus on describing the factors that have a significant effect on mountain climbers' hazard perception of Mount McKinley and reporting the important demographic cross-sectional characteristics of the climbers present. Variables of the climber demographics include gender, age, race, ethnicity, home country, education level, income level, family structure, personal climber experience/history/certifications, and personal motivations to climb. Responding climber perception variables include responses to potential crowding issues, environmental concerns, fears of the climb, climber confidence and success, and changes in perceptions 'before' and 'after' the climbing trip. 310 surveys were administered, and from the climbers surveyed (n = 72 respondents), a majority of the respondents (n = 56), (77.7%) indicated that the level of crowding on the peak remains within acceptable limits for the permit system that is currently in place at Denali National Park and Preserve.

Key Words: climbers, Denali, highest peak phenomenon, mountaineering, Mount McKinley, crowding, summit fever, visitor experience.

I. Introduction and Overview

The crowning icon of Alaska, Mount McKinley is North America's highest peak at 20,320' (6194m). Known to Native Americans (Athabascans) as Denali, or "The High One" of the greater Alaska Range, the mountain is a popular climbing destination, and the signature of Denali National Park and Preserve. (In respect to cultural ideals, Mount McKinley and Denali are used as the names of the peak throughout this report regardless of Geographic correctness). The great mountain rises nearly 18,000 vertical feet (5,500m) from the surrounding lowlands, making the peak's vertical elevation gain far more dramatic than even Mount Everest (Palka 2000). Most people attempt to climb Mount McKinley from the West Buttress route via Kahiltna Glacier, the most popular approach (88% of all climbing attempts since 1976). Three other routes involving the West Buttress Kahiltna Glacier approach include West Buttress Traverse, West Rib, and Upper West Rib. The four routes mentioned bring the historic total to 96% of all climbing attempts coming from the Kahiltna Glacier and the traditional NPS camp at 14,200'/4300m (NPS 1979-2008, NPS 2008). On these standard routes to the summit, the mountain can be climbed utilizing overnight camping, acclimatization techniques, and load carrying to higher camps, with an average expedition duration of 17.6 days for groups that summitted in 2007 and 16.9 days for all expeditions in 2008 (NPS 1979-2008). Over the past 15 years, climber attempts to Denali's summit has fluctuated between 1,108 (NPS 1993) and 1,340 persons (NPS 2005) each year (NPS 1979-2008). 1,272 climbers registered to climb Denali in 2008. Of those, about 30% were part of a guided trip, while the other 70% climbed independently. Overall average age was 38 years and only 9% of the climbers were women (NPS 1979-2008). Preliminary 2009 season statistics indicate that 1,161 climbers attempted McKinley, and 682 (59%) of those climbers made it to the top (NPS 2009). Figure 1 details statistics for the past 23 years since the origin of the electronic database in 1976 (McIntosh et al. 2008).

The overall summit rate in 2007 (47%) was the lowest since the years 1998 and 1999, which were summit rates of 36% and 43% respectively (NPS 1976-2008). Conversely, the most recent data from the 2008 and 2009 climbing seasons indicated a very successful season compared to other years with summit rate of 59%. Since 2005, when the number of registered climbers on Denali was reported at an all time high (1,340), the number of attempts decreased in 2006 and slightly increased again in 2007, with an average summit success rate of 52%, just off the historic mark of 53%. Data through the 2006 climbing season indicated that there were 96

recorded deaths since 1903 and the fatality rate has historically been decreasing to a value of 3.08 per every 1,000 climbers (McIntosh et al. 2008). Tragically in 2007, there were five reported fatalities, one in 2008, and four in 2009 (increasing the total historic deaths to 106) and numerous injuries suffered above 7,200 feet (2195m), in lieu of the approximately 1,200+ summit bids the past three seasons (NPS 1979-2008, NPS 2009). With the continuation of the guiding service contracts for the coming years to the six major guiding services on the mountain (Alaska Mountaineering School, Alpine Ascents International, American Alpine Institute, National Outdoor Leadership School (NOLS), Mountain Trip International LLC, and Rainier Mountain Guides Inc.), the number of climbers on Denali is likely to stay above 1,200. Popularity of climbing may also increase the numbers from private groups attempting the peak. Regardless of potential climber visitation increases there will be a multitude of challenges and issues that need to be continually addressed and mitigated in future seasons.

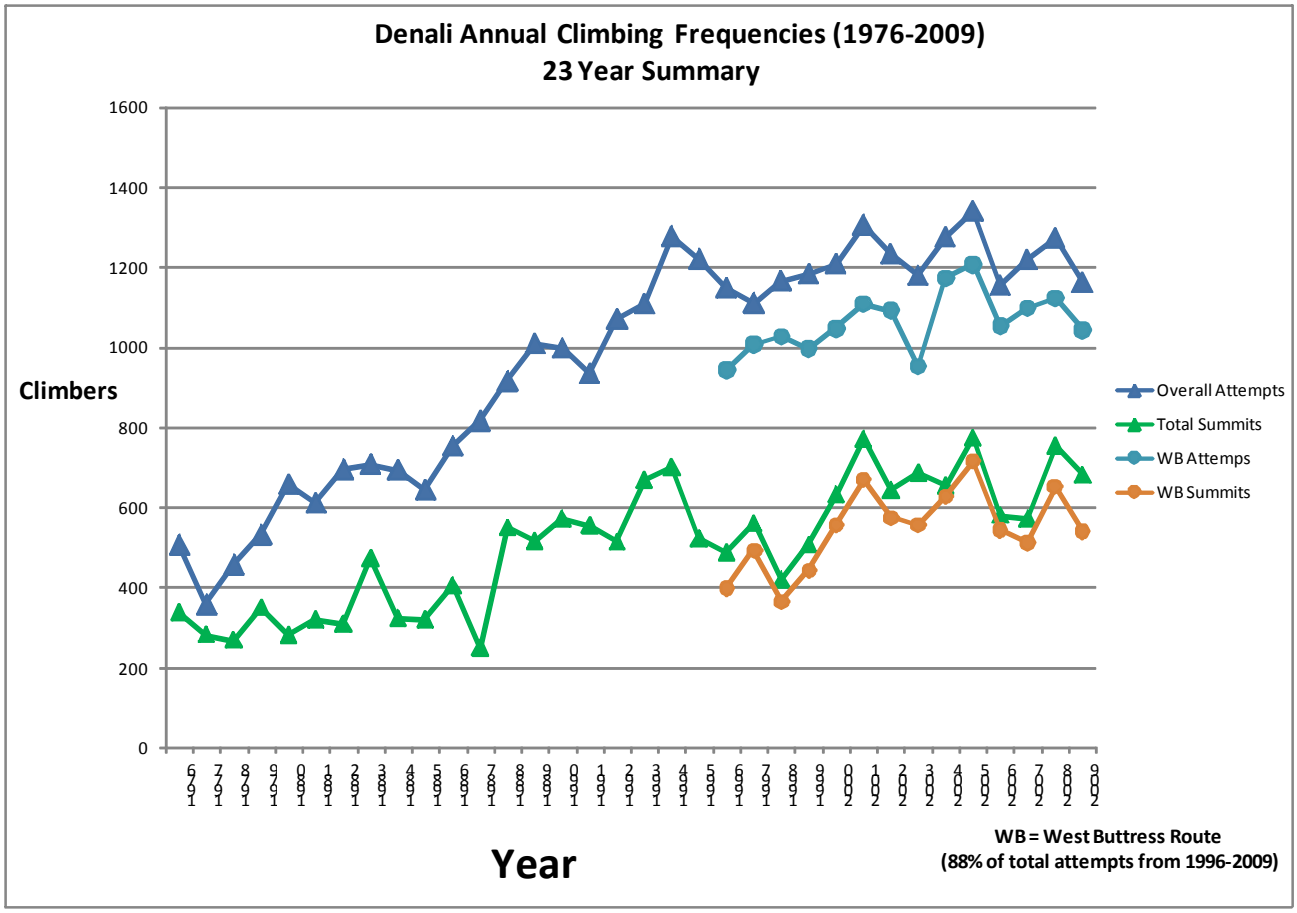

Figure 1. Mount McKinley Climbing Statistics 23 Year Summary. Source: (NPS 1976-2009).

A. *Statement of Issue*

Several important issues are of interest to the climbing community and land managers in Denali National Park & Preserve. For this project, two definitions of "summit fever" are considered. "Summit fever" is a concept placed only on the periphery of this research, a term defined as 1) an increasing desire of many to reach out and touch the highest point; and, 2) getting to the summit at all costs, regardless of consequences, fears or challenges. 100 years ago, very few people tried to climb Mount McKinley, and the first ascent was not accomplished until 1913. Population growth, contributing to sheer numbers of climbers, is the common explanation for the high climbing frequency (Kedrowski 2009). "Summit Fever" exists due to the fact that there are many climbers on the mountain which may cause a multitude of different environmental and social concerns for the National Park Service. Therefore, the purpose of this research is an investigation of 'summit fever': examination of climber's experience levels, crowding, climber's perception of risk, and defining success on Denali to develop new knowledge about the different demographic backgrounds, visitor experiences and perception of inherent risks associated with a summit attempt of the highest mountain in North America, and one of the continental "seven summits". With approximately 1,200 climbers trying for the summit of Mt. McKinley in a typical climbing season, it is of interest to determine who the climbers are and where they are from (this data is already recorded by NPS annually, but further information may be gathered and used to analyze data collected in this study). The demographic information will next be combined with asking climbers if the level of crowding is within acceptable limits (including topics such as human waste and trash concerns), and how each climber defines success on any particular climbing attempt. Ideas have been raised in recent discussion as to placing a potential cap on climbing permits for attempting Mount McKinley each season (NPS 2006, pp.138, 161-162). One value that has been proposed is 1,500 climbers per season (Pemberton 2005, NPS 2006), well above the record total of 1,340 in 2005. In fact, recent changes to the permits issued on McKinley by the Superintendent of Denali National Park & Preserve (Paul R. Anderson) has been set at a maximum of 1,500 climbers per season (Federal Register 2008) effective starting April 1 to August 1 beginning with the 2009 climbing season. Lowering the allotted permits to 1,000 may also be feasible, yet might have associated positives and negatives. Which is the best management alternative? The information collected and conclusions drawn from this proposed research may benefit the National Park Service (NPS) in

order to continue to manage and accurately monitor the climbing access to the mountain for years to come.

B. Literature Review

Risk taking within the recreational activity of high-altitude mountaineering presents structural components of real or perceived danger in which the participants have to cope with an uncertain outcome by means of personal skills and resources (Ewert & Hollenhorst 1997). In particular, high-altitude climbing entails physical danger (ranging from minor injuries to death) primarily due to environmental conditions, low temperatures, and altitude-related illnesses such as acute mountain sickness and cerebral and pulmonary edema (Wilkinson 2001, Burke & Orlick 2003). Because of the voluntary pursuit of risk (Slovic 2000, Smith 2001), the lack of evident external rewards, and hence the essentially non-utilitarian nature of high altitude climbing, sport psychologists have focused on the investigation of the motivational patterns underlying such activity (Burke & Orlick 2003, Delle Fave et al. 2003).

Most researchers have advocated personality and sensation-seeking theories to explain risk taking and success in climbing (i.e. McKinley, see Ewert 1994). The psychological effects of high altitude on mountaineers have also been examined and play a significant role in the thought processes of climbers with these particular personalities during an expedition (Ryn 1988). Personality tests, such as the Eysenck Personality Questionnaire, Zuckerman's Sensation Seeking Scale V, and Cattell 16 PF, showed that the personality profile of climbers is characterized by emotional stability, extraversion, conformity to social norms, search for thrill and experience by socialized means, and boredom susceptibility (Goma & Freixanet 1991, Breivik 1996, Egan & Stelmack 2003). Other researchers have investigated risk seeking as a goal-directed set of behaviors. From this perspective, risk taking is not a goal per se but a means for climbers to fulfill other goals, such as the need for arousal (Ellis 1973; Gould & Tuffey 1996) and autonomy and self-determination (Frederick & Ryan 1995). Specific mountaineering mental strategies have only recently been examined in detail (Burke & Orlick 2003), yet examining success and what defines success on a climb (especially on a mountain like McKinley) has been largely ignored. According to Burke & Orlick (2003) success is simply making it up to the summit and back down alive. This study will examine success from all climbers based on their perceived responses, which is likely to have a variety of outcomes.

Popular mountaineering literature is full of examples explaining why climbers climb. Four notable climbers mention that they always felt the need to climb high mountains (including Denali) due to their 'burning ambitions', 'seriousness of purpose', 'sense of community' with other climbers, 'admiration by others for their own self-sufficiency', and 'thirst for the isolated places' (Messner 1989, Coburn 1997, Krakauer 1997, Viesturs 2006). A few others have attempted to generally describe the composition of such 'thrill seekers' in regards to other adventurous sport experiences (Cohen 1979, Hall & MacArthur 1994, Jones & Ellis 1996, Floyd 1997). Rosen (2007) examined the rise in adventure travel with its connection to urban life, and the more specific motivations of mountain climbers and concluded that different climbers climb for different reasons but most often to escape 'ordinary life' and 'stand out from the crowd' (Cohen 1979, Rosen 2007).

In addition, it should be noted that the early literature has now set the standard in differentiating between solitude, user-density, and crowding (Stewart & Carpenter 1989, Patterson & Hammitt 1990) and has been further investigated in a mountaineering setting similar to Denali National Park & Preserve at Mount Rainier National Park (Lah 2000). While density can be an actual physical measurement (counting the total number of climbers in a given location), solitude and crowding are psychologically determined. In the case of crowding, how 'crowded' an area is, is determined by the expectations, observations and past experiences of the individual, as previously demonstrated on Mt. McKinley over a decade ago (Ewert 1991, 1993). The ideal preference for most visitors to the high altitude environment is to have the 'optimal experience' (Csikszentmihalyi 1969, 1975) where the expedition met or exceeded all expectations and was very enjoyable to be a part of. This may include characteristics of crowding. "Optimal experience" is characterized by the perception of high environmental opportunities for action (challenges) and adequate individual capabilities (skills; Massimini et. al 1987). Additional features of this experience are focus of attention on the task at hand, control of the situation, clear goals, feedback from the situation, well-being, personal satisfaction, and intrinsic reward (Csikszentmihalyi, 1975, 1990, Csikszentmihalyi & Csikszentmihalyi 1988, Kowal & Fortier 1999). In nearly all cases, overcrowding may possibly detract from these important traits of the 'optimal experience', which will be investigated here in the most un-biased manner possible.

It is important to recognize that nearly all of these studies mentioned describing visitor experiences kept satisfaction and quality of visitor experience (psychological) separate from actual crowding concepts (physical), even though crowding on a high mountain peak is an important component of the visitor experience satisfaction. Examining crowding and climbers perceptions of the overcrowding on major high-altitude peaks of the world is largely scattered within the scholarly literature, and also minimal for McKinley in very recent years. The first major step in examining crowding on a high-altitude mountain was done in Denali National Park and Preserve, Alaska, in the early 1990's on Mount McKinley (Ewert 1991). The study surveyed 360 climbers and focused exclusively on climber demographics, trash, human waste issues, and crowding. It identified some characteristics of mountaineering visitors, climbers' perceptions of the mountain environment, and certain preferred management options in terms of the crowding on McKinley. The major findings most relevant to this research proposal are that crowding on the peak was considered a problem for only 32% of the climbers whereas slight majorities (57%) were actually against limiting the number of climbers. Overall the study showed that trash, sanitation, and crowding are still within acceptable limits for most of the climbers attempting to summit the peak. Nearly two decades later and a 300-500 climber increase in attempts annually on Denali, including future anticipated increases of up to 15%, provides a need for repeating these questions.

Mount Rainier research has also been done by Ewert in combination with the Denali National Park and Preserve research with two other studies (1985 and 1994). One of the studies (1985) was performed first on Mount Rainier looking more at the psychological aspects of mountaineering and motivational dimensions of the climbers. Neither study specifically examined crowding on the respective peaks (Rainier and McKinley), but rather chose to focus on motivation and risk taking (Ewert, 1994), as well as the relationships between climber's motives and their level of mountaineering experience (Ewert, 1985, 1994). These studies both utilized an itemized questionnaire and employed statistical methods to analyze the relationships. In the 1983 climbing season, Ewert (1985) surveyed 480 climbers and evaluated 460 of the returned questionnaires from 3 different access points to Rainier. Through this landmark study, it was concluded that climbing areas and routes attracting the more experienced climbers may fit the motivations of the user if they are kept more rugged and less crowded. Despite this study being focused on motivations of climbers, the crowding issue was marginally addressed and easily

recognized because it was evident that the climbing routes demanding less skill were clearly frequented by more climbers than the isolated and more difficult routes. This may still be true today, however, it has been over 20 years since this has been examined, and a variety of other issues and perceptions still warrant further investigation in a similar fashion on Mount McKinley and the West Buttress route.

The 360 climbers surveyed on Mount McKinley for the later study (Ewert, 1994) revealed that highly experienced climbers are more interested in helping others, expressing creativity, using the mind, and self expression than either the intermediate or beginner climbers. On the other hand, climbers with less experience gave more motivational importance to disengagement from normal life, competition, development of climbing skills, or getting to the highest point in North America. Risk taking factors were generally scored low in the 1994 study because it appears that mountain climbers do not perceive what they are doing at any given point as a huge risk, even though the public may think so. Essentially the only difference in these two studies from Ewert is that in 1994 risk taking characteristics of climbers was analyzed in addition to the relationships between climbers' motivations and levels of experience, which was initially studied in the 1985 project. Crowding issues, and determining if crowding is within acceptable limits was only indirectly mentioned in these projects, and a lot has changed in the decades since. There are many more climbers now than ever before, and this study will be able to update and further interpret many of these frameworks.

A recent significant study was performed to examine success and mental strategies within this framework to be used on McKinley by elite climbers while climbing Everest (Burke & Orlick 2003). Only ten climbers were interviewed in the study, and common strategies of success were identified, as well as factors that created the greatest challenges on the mountain. This research study plans on evaluating the responses of climbers 'before' and immediately 'after' the climb, as opposed to only 'during'. However, this situation is similar: McKinley is high altitude, cold, and a climb that warrants an expedition style of climbing just like Everest. Therefore, Burke and Orlick (2003) is a very good study to refer to as a guideline for referencing climber's perceptions while they are engaged in a challenging climb.

Furthermore, perceptions of the mountaineer will change as the adventure of the climb progresses. All of the 'thrill-seekers' that engage in the climb will have a certain level of expectation going into the trip. Fears and perceptions may be different based on a variety of

factors, with prior experience playing a significant role (Moore 1995, Pomfret 2006). During the adventure, nervousness and apprehension may completely go away, or it may be dictated by the interaction of risk and competence resulting in the specific challenges engaged. Near the end of the adventure, or after the adventure, a climber of Mount McKinley may have experienced enjoyment and satisfaction of achievement, regardless of whether the summit was gained. The framework is essentially based on what the 'thrill-seeker' puts into their climbing experience, and in the case of McKinley, or any higher mountain for that matter, positive outcomes are directly impacted by the level of specific perceptions and experiences that any climber has while on their expedition or outing (Pomfret 2006).

Additional McKinley-specific research has mainly examined visitor experience and environmental impacts. Many of these studies clearly have been necessary due to the volume of climbers and other backcountry visitors travelling through areas of the park. For example, the Clean Mountain Can (CMC) program has been developed and implemented through research and field studies since 2000. The CMC was conceived by Ranger Roger Robinson with help from his Denali mountaineering staff for use in the rugged environment. In 2000, a 24-day ranger patrol led by Ranger Robinson proved it was possible to remove human waste completely from the mountain using commercially designed river toilet boxes. The ranger staff next worked with the manufacturer of this toilet to create a smaller, lighter version. Through a grant from the American Alpine Club (AAC), 50 of these toilets were made and used voluntarily by climbers in 2001. This wider trial ensured it was feasible for the average climber to remove their human waste from the mountain (NPS 1979-2008).

The rangers continued to work with the same manufacturer to improve the can, and through grants from the Access Fund and the AAC, 220 of these newly designed CMCs were purchased for a large scale trial. Over 500 climbers used the CMCs, successfully removing their human waste from the polluted 17,200-foot high camp. Due to this success, beginning in 2003, Denali National Park & Preserve began requiring that all human waste be removed from the high camp on Mount McKinley and anywhere above the 14,200-foot camp. This advancement in human waste disposal might allow managers of climbing permits to increase rather than decrease as human waste and diarrhea outbreaks are beginning to become less of a concern (McLaughlin et al. 2005) for the high volume of climbers present. However, the continuing policy of CMC use remaining voluntary instead of mandatory for travel in other glaciated areas of the Park shall be

posed to the climbers because many other areas follow the "*all human waste must be crevassed with a biodegradable plastic bag*" policy (NPS 2006), and the impacts of the policy for future generations could be devastating.

The Ruth Amphitheater, Kahiltna 7,200' Base Camp, and the Pika, Buckskin, and Eldridge Glaciers in Denali National Park and Preserve have exceptional scenic values, provide access to some world renowned climbing destinations, and are also the primary destination for air taxis and scenic airplane tours in the Park (Watson et al. 2005). Recreational visitation to these areas has grown dramatically in recent years, predominately for the routes to the climbing basecamps along the Kahiltna Glacier. Qualitative interviews with day users, skiers, mountain climbers and air taxi operators provided substantial insight into some of the dimensions of experiences the park managers may want to try to protect (Watson et al. 2008). This research helped park managers understand the value of factors influencing visitor experience in pristine locations (crowding and various encounters such as number of plane fly-overs) in order to support selection of management actions that reduce user conflicts and improve visitor experiences in these high use, but remote areas (Watson et al. 2005, Watson et al. 2008).

Specific direction for backcountry management for Denali National Park and Preserve for the next 20 years has been provided by a park-wide backcountry management plan of human environmental impacts recently released (NPS 2006). Modeled like other National Park Management Plans (Rochefort 1989, Samora 1989, Rochefort & Swinney 2000), the Denali National Park and Preserve management plan is very extensive, describing how the National Park Service will act to provide future generations with a variety of opportunities to experience the Denali backcountry while protecting park wildlife and other natural resources, wilderness resource values, and subsistence resources. Within the management plan, there is clear indication of the need to address climbing access.

> "The number of climbers on Mount McKinley has doubled in the last 20 years. As climber numbers continue to rise, crowding on technical sections of popular routes, such as the fixed lines section of the West Buttress, could jeopardize visitor safety. Congestion at campsites also raises questions about the quality of the experience within this part of the Denali Wilderness, and the level of use has created a substantial human waste management concern. Several climbing areas in the park additions, such as Little Switzerland and the Eldridge Glacier, are becoming new popular destinations for climbers and mountaineers, leading to concerns about human waste and eventual crowding in those locations" (NPS 2006, p.6).

Clearly, many topics describing the visitors to Denali National Park & Preserve have been researched, yet there is still a need for more new studies, and specifically more projects on the mountaineering occurring in the park. The research here seeks to focus on the climbers and evaluate the mountaineering experiences from the origin of most expeditions from the Kahiltna Glacier at 7,200'/2194m to the 14,200'/4300m camp and above, but will also interpret definitions of success and perceptual challenges involved with the climb in addition to the relevant crowding analysis. The geography of climber demographics will also be related to particular relationships and trends based on specific climber backgrounds.

C. Scope of the Study

Research into the visitor experience, including crowding, risk perception, and defining success associated with high altitude climbing has theoretical and applied significance. For climbing Mount McKinley (Denali), or any other iconic peak in the world, 'summit fever' is a term that is non-existent in the current scholarly literature. From the geographer's perspective, this analysis of climber's perception on the peak will isolate the variables and identify important components of the 'summit fever' framework, while also observing the different views of the climbing frequencies with demographics of climbers from all over the world. There are no comprehensive conceptual models that account for basic factors such as climber's experience on previous expeditions or mountains, number of year's climbing experience, sequential levels of fears and challenges (risk) encountered at various parts of the expedition, or measurements of acceptable level of crowding on standard climbing routes (Figure 2).

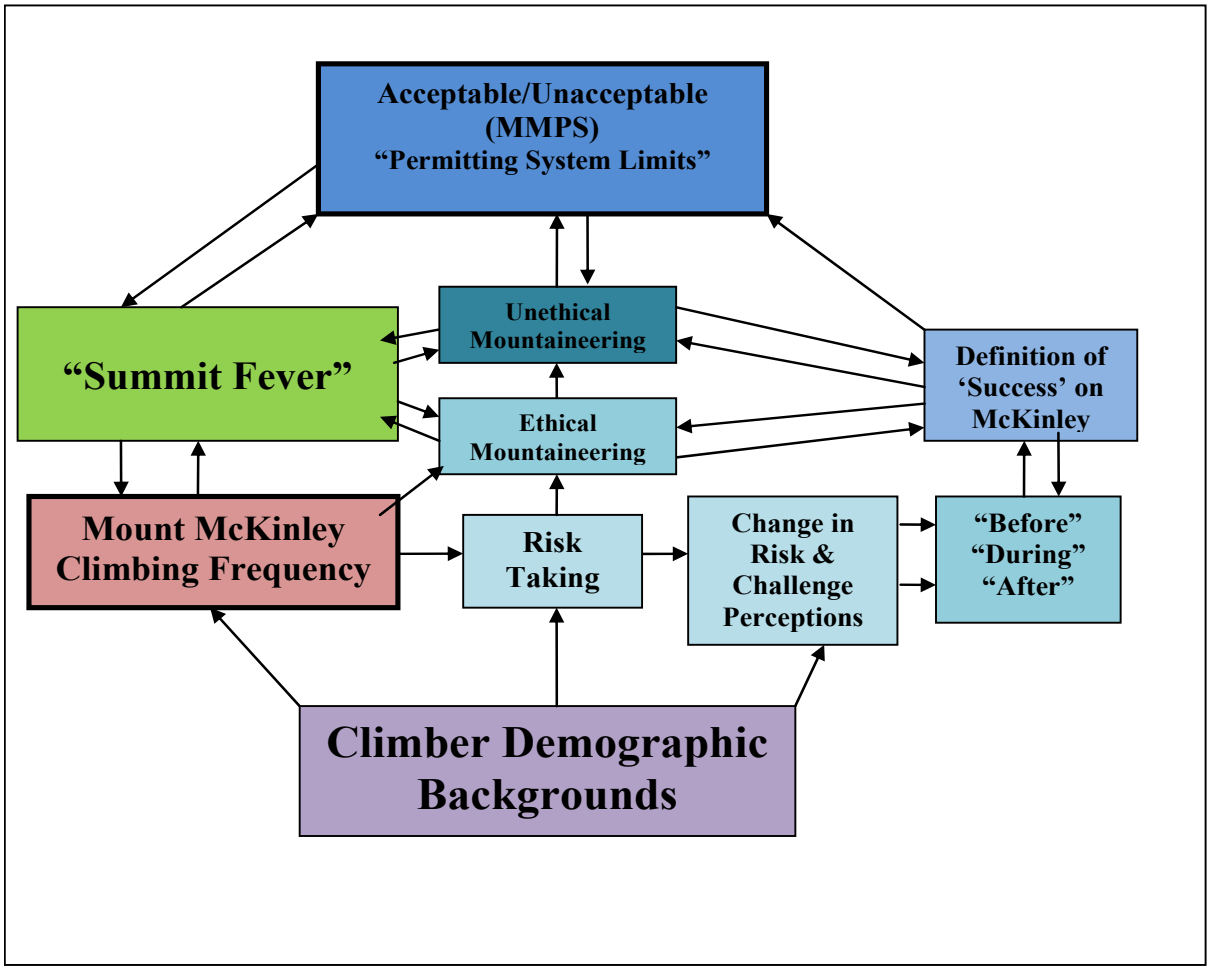

Figure 2. General System Dynamics conceptually organized within the McKinley Mountaineering Permit System (MMPS) and "Summit Fever" Framework

The lack of a well developed theory to explain the dynamics of the climbing frequency issues and associated problems on high altitude mountains as a whole has important implications for applications of good management practices and permitting systems not only on Mount McKinley, but around the globe. Despite stringent guidelines and permitting regulations to manage climbing visitors to Denali National Park & Preserve by the NPS, officials note that visitation was reaching a plateau. However, the 20 year management plan is projected to be on the increase of up to 15% (NPS 2006, p. 138). Economically, the overall number of climbers has helped the park's revenue and staffing of the West Buttress route and camps tremendously because people are still finding ways to pay for their permits to climb and also add money to the

local economy during their trips to the region, especially the town of Talkeetna. This study will be able to qualify and quantify the perception of these visitors. It will also seek to understand how the visitor experience (hopefully "optimal experience", Massimini et al. 1987) to Denali National Park & Preserve is shaped and how it can be improved so that risk to all who venture there can be lowered and managed by the various stakeholders involved and further implemented in the dynamics of the McKinley Mountaineering Permit System (Figure 3).

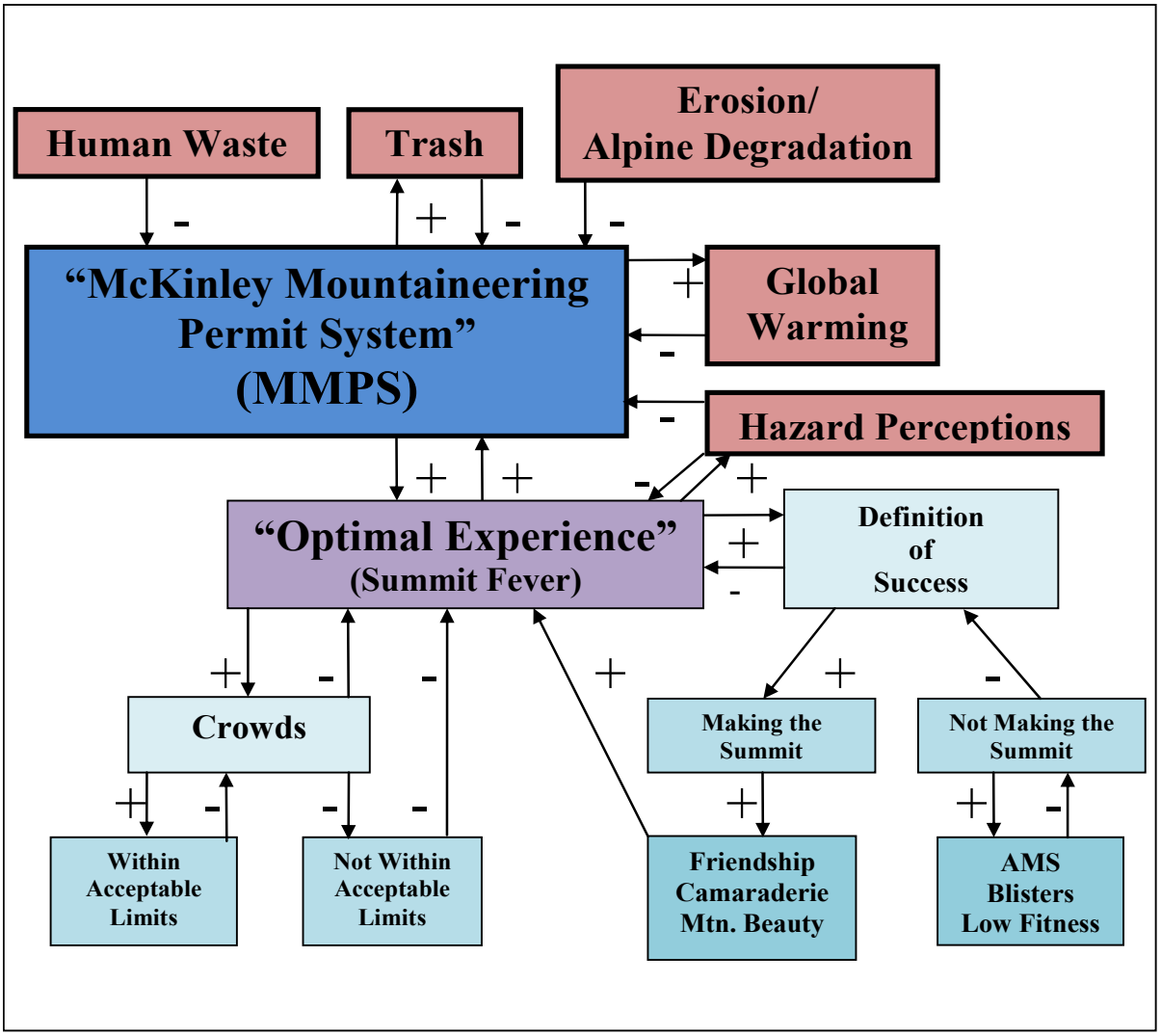

Figure 3. Specific System Dynamics and Feedback Relationships of the McKinley Mountaineering Permit System (MMPS), with "Summit Fever" and "Optimal Experience" being the driving forces overall.

D. Intended Use of Results

Results will be readily available to give the NPS an up to date analysis of the current mountaineering visitors to Denali National Park & Preserve and to determine if the level of crowding on McKinley is within acceptable limits for those who attempt the summit. Further dissemination of the results of this research will be through preliminary oral presentation at a national scientific meeting, publication of refereed journal articles, and potential publication of a capstone work, a scholarly book on the climber's perceptions of climbing high mountains in the world. The most important dissemination objective is incorporating the climbing frequency perspectives of all the climbers involved, discussing success on the peak, and drawing conclusions as to how some of these issues, concepts, and conflicts may be resolved to be readily included in any direct management of the current McKinley Mountaineering Permit System (MMPS).

II. Methodology

A. Research Questions

The objectives of the research in this project are to explore the subsequent relationships of a sample of climbers characterized by the phenomenon of McKinley 'summit fever' that appears to be taking place. The basic research strategy involves utilizing a surveying technique to gauge the overall impressions of a representative sample of McKinley climbers on routes launching from the most popular approach on the mountain: the Kahiltna Glacier. Climbers will be surveyed from one location, starting at the standard drop off point from the 7,200'/2194m Kahiltna basecamp 'before' the expedition proceeds up the mountain. When the climbers return from their trip and are awaiting transport from the Kahiltna basecamp, they will also fill out an 'after' expedition component of the survey. For the pilot study, a minimum of one month (May and part of June 2009) was included to collect representative samples of the climbing population for a majority of the peak climbing season. The research questions focus on descriptively gauging the mountain climber's perceptions regarding climbing frequency issues, challenges encountered, and an attempt to define personal success 'before', and 'after' climbing the mountain. Although some previous work has focused on the quality of experience, crowding, and risk perception for climbers, major research efforts have not dealt recently with Denali National Park & Preserve. The primary methods of the investigation include statistical analysis

for climber demographics, experiences, and climber perceptions, all collected via survey from field research.

These results attempt to address the research needs by building improved, widely applicable, general explanations of visitor experience, crowding, and subsequent perception of the risks encountered by climbers as they scale Mount McKinley. These explanations will include a range of physical, environmental, and social characteristics that have a significant effect on the mountain climbing frequency of McKinley. Emphasis will be on the relationships between climber's personal expertise, their demographic backgrounds, and the amount of crowding they encounter at particular stages of their climb of the mountain. Assessment of the specific factors experienced by the climbers 'before' and 'after' their attempt of Denali will provide an improved understanding of the entire McKinley 'summit fever' phenomenon. By assessing these relationships from a geographic perspective, conclusions about the permit system from the climber's perspective can be drawn. Specific questions guiding the proposed research include the following:

1. What are the major similarities and differences in the cross-section of the climber demographics on the issue of crowding surveyed on Mount McKinley? Does Crowding exist? Is the level of crowding within an acceptable limit for the climbers present?

2. From a climber's perspective, what can be done to manage the existing crowding issues and the permit system on the highest mountain in North America?

3. What factors have a significant effect on the mountain climber's perception and actual fears and challenges (hazards/risks) encountered on Mount McKinley 'before' and 'after' a summit attempt?

4. What is the relationship of success versus overall climbing experience on Mount McKinley? In addition, what actually constitutes true 'success' on McKinley?

B. Description of Study Area and Survey Administered

The basic geographic and demographic units of study in this investigation are the climbers that arrive at Talkeetna, Alaska near Denali National Park & Preserve from all corners of the globe with aspirations of standing atop North America's highest summit. These mountaineers were asked to complete a 30-item paper based survey of their 'Mount McKinley

Experience' which was administered in two phases: "before", and "after" their climb. All of the surveys for this project were taken inside a research tent or survey respondent tents located at the 7,200'/2194m Kahiltna basecamp, monitored 24 hours a day by the research staff. The entire survey component was paper-based, and past experience on piloting this study on Mount Rainier (Kedrowski 2008) indicated the many limitations of paper-based surveys, including hauling only limited amounts of paper to high camps. However, all the surveys were flown directly to the glacier and thus were easily transported to the survey site. Each of the three survey components took no longer than 10 minutes to complete by respondents during the data collection. To answer the research questions in this study, it will be necessary to identify the responses to the survey within the "before" and "after" time frames of each climber's expedition. Therefore surveys were numerically organized in a format used previously (Kedrowski 2008). Organization of the climber demographics, prior experience and expertise, perception of fears, problems encountered, and climbing frequency issues will all be distinguished in this temporal format. A period of at least one month was spent at the basecamp site(s) during the peak of the climbing season on Denali (May to June), which allowed for adequate sample sizes to be surveyed for analysis.

It is also imperative to note that the results of this pilot study will be valuable in making an application for OMB (Office of Management and Budget) approval with the NPS for doing further extensive studies beginning in 2010 or 2011. A more comprehensive study would utilize computer technology and internet access at the Talkeetna Ranger Station while also requiring mandatory participation in the 'before' and 'after' survey as part of the current check-in and check-out process as needed by the NPS ranger staff to further help collect data and improve the current permit system used by all registered Denali climbers. The researcher also spent some time in Talkeetna from a location separate from the NPS Ranger Station in order to test out the suitability of recruiting climbers of Mount McKinley to voluntarily participate in the surveys. This component of this pilot study required additional days in Talkeetna that proved useful in assessing the feasibility of future research to be performed both on and off Mount McKinley.

C. Study Procedures, data collection, and analysis

1. *Defining Terminology:* "**Before**" refers to the period of time leading up to and including actual travel to the Kahiltna Glacier (by plane to 7,200'/2195m) to start the expedition. Checking in at Talkeetna is mandatory per NPS guidelines by all climbers before they make their attempt on Denali. A climber is still in the '*before*' phase of the climb of Denali up until the start of the first climbing up (down) the glacier after plane or helicopter drop-off, (or backpacking into the National Park in rare cases). "**During**" the trip includes the entire duration/acclimatization and summit attempts of the climb (if multiple climbs are necessary) from the time a climber takes his/her first steps on the glacier into the backcountry above the 7,200'/2194m Kahiltna basecamp until they return safely back to the Kahiltna basecamp to declare the official end of the expedition with plans to return to Talkeetna and NPS check-out. Any time a climber returns to camps on the glacier or back to Talkeetna with an agenda to continue making trips back up the mountain in the same season, the expedition is still in the '*during*' phase. "**After**" is considered the period of the expedition '*after*' a successful summit (or not summitting) AND a safe return to Kahiltna's 7,200'/2194m basecamp. The climber will have declared their expedition or trip officially over (planning to head home soon) with no intentions of climbing back up the mountain in any capacity.

2. *Experience and Skill Level Analysis.* Investigation of mountaineering experience and skill level of climbers was formulated by having individuals respond to the following categories (similar to Ewert 1994): beginner (little or no mountaineering experience), novice (first major expedition-trip on Denali (above 20,000-ft, 6,100m) but some glacier travel experience and one or two previous shorter climbs to peaks of less than 20,000-ft, 6,100m), intermediate (two to five extended climbs or expeditions with at least two above 20,000-ft, 6,100m), glacier travel, winter climbing experience), advanced (over five major extended climbs-expeditions with five or more above minimum 20,000-ft, 6,100m, technical challenges, high altitude, arctic-like conditions). Individuals were also asked to select and identify peaks they have climbed, routes climbed, and expeditions they have been a part of for any locations in the world they have traveled. If individuals reported themselves as being highly experienced but have not participated on any expeditions to peaks that are traditionally considered challenging, they were not included in the analysis. This procedure was adopted (Ewert 1994) to eliminate individuals whose reported level of experience and skill are not congruent with their actual accomplishments.

Skill level was also analyzed in the same fashion. Prior to the start of the expedition, climbers were asked to rate themselves according to their mountaineering skills and classify themselves into the following groups (Ewert 1985, 1994): novice (beginner snow and ice climber), intermediate (can lead 5.6 rock and ice climbs at grade III under alpine conditions), expert (can lead 5.9 rock and ice climbs at grade IV under alpine conditions). For example, if an expedition participant reported an intermediate level of mountaineering skills but has not accomplished a difficult mountaineering route, the survey questionnaire was discarded from the analysis. Yosemite Decimal System (YDS) classification was used in the skill level groupings and is clearly described in Table 1.

Table 1. Class 5 climbing described using the Yosemite Decimal System (YDS) Classification.

Class	Description
5.0-5.7	Easy for experienced climbers; where most climbers begin. Two or three great handholds/footholds are present for upward movement using the four extremities.
5.8-5.9	Where most weekend climbers become comfortable; employs the specific skills of rock climbing, such as jamming, liebacks, and mantels. One or two good handholds/footholds are present for upward movement using the four extremities.
5.10	A dedicated weekend climber may attain this level; strong fingers and great footwork necessary, only one good handhold/foothold per four extremities for upward movement.
5.11-5.15	The realm of true experts; demands much training and natural ability, and often, repeated working of a route utilizing very few handholds of solid grip, many times zero handholds at all per four extremities.

After the surveys were completed by the prospective McKinley climbers, a limited number of questionnaires were rejected and not used for the analysis due to a lack of congruence between the actual expedition climbs and the level of self-reported mountaineering experience, expertise, and climbing skills. Connections between mountaineering experience and mountaineering skills was assessed using correlation analysis (Kendall's Tau). A favorable p-value (99% confidence level, $\alpha = .01$) indicates that the respondent climbers are fairly congruent with their past climbing experience and levels of perceived skills. This allows for a reliable placement of the Denali climbers into three individual levels of mountaineering experience classification: novice (novice and beginner), intermediate, and advanced. The cross-section of the climber demographics (where climbers are from, how many years they have been climbing,

etc) was also taken into account with this initial classification. Furthermore, this initial classification allowed the examination of relationships to issues addressed in this study, such as fears and problems (risks) encountered 'before' and 'after' the climb, including crowding perceptions on Mount McKinley.

3. *Analysis of Factors Affecting Climbers Perceptions "Before" and "After" the Climb:* To determine the patterns of factors affecting a climber's perception of climbing McKinley prior to and after the conclusion of the trip, an initial structure of fears and then actual challenges encountered on the climb was assessed utilizing the survey responses and a Discriminant Analysis (DA) to predict the notable experience level and skill group differences between particular variables concerning McKinley climbers. Wilks' Lambda (Λ) was used to determine significance of any predictive function (Mertler & Vannatta 2002) at each phase of the McKinley expedition ("before", and "after") and across the three climber experience/skill level categories. The influence of experience will have an important role in determining climber's perceptions of the various factors encountered throughout the entire climbing trip. Not only were the relationships between certain factors observed and analyzed for the climbing trip, but the factors were also examined with the reported levels of experience and skill correlated by the climbers in their demographic responses prior to the climb in the initial experience and skill level analysis. Examples of these perceptual fears and actual challenges encountered (risks) included such variables as weather related (blizzards, cold, or high winds), climbing the mountain (crowds, seeing injured or dead climbers, falling into a crevasse, dying, or other environmental concerns), and physical bodily aspects (suffering from frostbite, dehydration, Acute Mountain Sickness, or High Altitude Pulmonary Edema). In the grand scheme, the relationship between fears 'before' the trip were analyzed with the actual problems, challenges, and conflicts encountered 'during' and then assessed in the perception of the climber immediately 'after' the conclusion of the climb. The DA allows the most important variables to be selected, and conclusions were drawn as to why those factors are such a concern to the climbers on McKinley. An evaluation of how these perceptual variables have changed over the course of the climbing trip was also assessed, and the subsequent relationships to the level of experience, skill and expertise of the climbers were specifically determined.

4. *Analysis of the crowding and permit issues:* Next, the most critical concern in recent years to the safety and well-being of all climbers on McKinley is climbing frequency, which was addressed in detail in the survey. All phases of climbing Mount McKinley include specific

questions in the 30-item survey that primarily focus on the crowded nature of the peak and applicable climbing permit concerns. The main question here is to assess from the climbers whether the amount of crowding or number of people encountered is within an acceptable limit for any given location on the peak, as well as overall. Perspective on the current permit system was also polled in ways that will be helpful to NPS managers to help maintain the current permit system in place. Crowding involving aspects of the Denali National Park & Preserve visitor experience was evaluated, ranging from basecamp concerns, particular locations up the mountain, and even specific sections of the climbing route up the peak. All questions posed were on a ten point Likert scale (Ewert 1991, 1994), ranging from 1 (not crowded at all), to 10 (extremely crowded). For specific questions surveyed 'before', and 'after' the climb, qualitative and quantitative analyses were performed on the data collected so that comparisons can be made and relationships can be distinguished. Once again, changes in opinions over the course of the trip and differences in perceptions of the crowding were evaluated based on the variety of demographic backgrounds of the climber's present, including the associated linkages to climbing experience, skill and expertise. Some solutions as to what can be done to further manage the current permit system may be drawn from this part of the analysis.

5. *Analysis of the Definition of Success:* A small set of survey questions fall outside of the issues mentioned above, but are critical concepts that add an important perspective to this project. Measuring success and climber's confidence on McKinley are important components of understanding what is important to the typical McKinley climber and determining what the definition of success is to the climbers. Some climbers may feel that participating on a McKinley summit attempt is only a success if they make it to the top. This question was analyzed 'before' and 'after' the climb and across the climber demographics. The goal was to see what the definition of success is for the majority of the McKinley mountaineers. Climber's confidence is another question that will be polled 'before', and 'after' the climb. It will be very informative to evaluate how confident a climber feels that he or she will make the summit as the expedition progresses, especially 'before' and then compare the actual outcome and feeling of making or not making the summit 'after'.

6. *Pre-survey Validation and Post-survey Analysis Tools:* Although the project included a large-scale survey technique and an on-site surveying method, post-survey statistical analysis of the data was possible by use of computer organization of the survey data, and the SPSS 16.0

statistical software package (SPSS Inc. Chicago, IL 2006). Texas State University Institutional Review Board (IRB) approval was obtained (Appendix B), and a pilot study of a similar version of this survey was first performed at Mount Rainier National Park. Additional validation was done by sending out the survey to some climbing colleagues of the principal investigator, as well as other climbers in the profession that have experience in high-altitude environments. The purpose of the pilot study was to clear up any confusion with the survey questions, validate the survey, assist Mount Rainier National Park with issues specific to their permit systems, and validate the prospective methods associated with this project. In the same way, this study is somewhat of a pilot study work-in-progress likely to open up further surveying investigation opportunity for future data collection on Mount McKinley.

III. Survey Results

A. Demographics of Responding Climbers

310 surveys were distributed among the climbers present at Kahiltna Basecamp, all of whom were attempting the West Buttress (WB) Route, or approaches to route variations on the southwest side of Mt. McKinley (i.e. West Rib). 97 surveys were returned (31.3% return rate), and 25 surveys were returned blank, not filled out by the respondents for various reasons (one survey was thrown out for lack of congruency between skill level and actual climbing experiences). 72 surveys (23.2% response rate) were completed, 66 male (91.6%) and 6 female (8.3%), with an average age of 37.3 years. The oldest climber was 64 years and the youngest was 22 years. 64 of the respondents were white/Caucasian (88.8%), six were Mexican/Hispanic (8.3%), and two Asian (2.7%). Climbers were from ten countries (United States (48), Mexico (6), United Kingdom (4), Germany (2), France (2), The Netherlands (2), Poland (2), Switzerland (2), China(2), and Argentina(2)), including 14 U.S. States (AK-14, CA-2, CO-6, IL-2, ND-2, NM-4, NY-2, OR-2, SD-2, TX-2, UT-4, VA-2, WA-2, & WY-2), averaging 17.31 years of formal education, with a maximum of 22 years (Professional Degree, Ph.D. or M.D.) and minimum of 13 years (some high school/high school graduate). Twenty climbers (27.7%) reported having at least a Bachelor's degree, twelve climbers (16.6%) had at least a Master's degree, and ten climbers (13.8%) had earned more than a Master's (Ph.D., M.D., or other similar professional degree).

The average household income of the moderately educated sample was $79,416 per year, and the climber incomes ranged from less than $19,999 per year (2 respondents, 2.7%) to over $200,000 per year (6 respondents, 8.7%), and the most common income bracket was 14 climbers (19.4%) making $100,000-$199,000 per year. A majority of the household incomes were shared between 2 people paying the bills (n = 30, 41.7%), or just a single breadwinner (n = 36, 50.0%), while most of the family sizes for the households were between one and three people (n = 54, 75.0%) and never exceeding six members except for one respondent who had 10 in their household. From the 72 climbers surveyed, 58 were employed full time (80.6%), 12 part time (16.7%), and 2 unemployed students (2.8%). From the reported employed/unemployed climbers, 70 of 72 (97.2%) stated they took extra time off from work to participate in outdoor recreation, including for mountaineering, while only 2 (2.8%) indicated they did not take off any extra time to participate in outdoor recreation activities. In addition to taking time off from work, the respondents indicated that they were given paid time off, or weeks of paid vacation, which may be used in conjunction to the extra time taken off from work to participate in outdoor recreation activities. The range of weeks of paid vacation varied from zero (0) to fourteen (14) weeks, with the majority of the respondents (20, 27.8%) receiving zero (0) weeks of paid vacation time, followed by 10 climbers (13.9%) getting two weeks of paid vacation time and 10 climbers (13.9%) also getting four weeks of paid vacation time. This would further indicate that up to nearly 30% of the climbers responding to the survey take unpaid time off from work to participate in mountaineering, and may have been taking off extra time from their jobs to climb Mount McKinley. From an economic standpoint, nearly all the sample of climbers spent money on their climbing trip to Mount McKinley. Climbing costs include items such as equipment, transportation to the mountain, food and fuel costs, climbing permit fees, and National Park entrance fees. Six climbers (guides on the mountain) reported that they did not have to spend any money to climb the peak. Two climbers reported that their trips cost a maximum reported value of $20,000. The average amount of money spend to climb Mount McKinley in 2009 according to this survey was $4,622.22, median $3,600.00 and mode (n = 12) $3,000.00 (all U.S. Dollars). The total value of all money spent as reported in the survey (n = 72) was $332,800.00.

Group sizes of the responding climbers ranged from solo climbers to a party of 10. The average group size was 4.97 (median 5), and the most common climbing party size was six (n = 20 respondents), second most common party size of four (n = 16). A majority of the groups were

private unguided independent, and the climbers (n = 40, 80.8%) from those groups indicated in the surveys that they were independent recreational/weekend climbers. Six climbers (8.3%) reported they were professional guides, eight (11.1%) reported they were professional independent climbers, and 24 climbers (33.3%) were clients on private guided expeditions from one of six guiding services licensed to take Mount McKinley climbers to the summit: Alaska Mountaineering School, Alpine Ascents International, American Alpine Institute, National Outdoor Leadership School (NOLS), Mountain Trip International LLC, and Rainier Mountain Guides Inc..

In addition to the specifics on climber demographics, the data from the surveys was entered into SPSS statistical software (during the month of September, 2009) to complete the analysis. The results of the data analysis is organized and presented below, according to the methods described in Section II.

B. Experience and Skill Level Analysis

Climbing experience was self rated by the climbers (n = 72) into four categories: beginner (n = 4, 5.6%), novice (n = 30, 41.7%), intermediate (n = 24, 33.3%), and advanced (n = 14, 19.4%). Climbing skill level (self rated) placed climbers into novice (n = 22, 30.6%), intermediate (n = 24, 33.3%), and expert (n = 26, 36.1%) groups. If individuals reported themselves as being highly experienced but have not participated on any expeditions to peaks and routes that are traditionally considered challenging, their information was thrown out of the analysis. However, in this study, nearly all respondents appeared to report their own experience and skill levels accurately, allowing all but one completed survey to be used in the analysis.

The relationship between mountaineering experience and mountaineering skills were assessed using correlation analysis (Kendall's Tau). A favorable p-value (.647, 99% confidence level, $\alpha = .01$) demonstrated that the respondent climbers are fairly congruent with their past climbing experience and levels of perceived skills. Therefore, a reliable placement of the Mount McKinley climbers into three individual levels of overall mountaineering experience classification is possible: novice (novice and beginner, n = 18, 25.0%), intermediate (n = 28, 38.9%), and advanced (n = 26, 26.1%). Additional information from the surveys showed a negative correlation ($p = -.361$, $\alpha = .01$) between overall mountaineering experience classification and number of years since the respondent listed their first experience climbing to

the top of a significant mountain. This indicates in the grand scheme from the surveyed sample of Mount McKinley climbers that in addition to a majority of them being classified as intermediate and advanced climbers (n = 54, 75.0%), the climbers also have relatively few years of experience in the mountains since their first summit of a peak. These climbers have become highly skilled and experienced in a relatively short amount of time, as indicated by this negative correlation. In fact, a small majority of the climbers surveyed (40, 55.5%) have only gained their first mountain summit since 2000, with the average year for first summit experience being a little over a decade ago in 1996. The highest amount of first time summit experience came from eight climbers each for two separate years (11.1% each) who indicated 2000 and 2007 respectively, were the years of their first climb to the top of a mountain. One respondents (1.3%) mentioned that this was their first mountain climb of any kind and had never been to the top of a mountain ever before, while one respondent climbed his first mountain way back in 1956.

C. Factors Affecting Climbers Risk/Hazard Perceptions "Before" and "After" the Climb:

Patterns of factors affecting a climber's perception of climbing Mount McKinley prior to and after the conclusion of the trip were determined by incorporating an initial structure of fears and then actual challenges or conflicts encountered on the climb. Through Discriminant Analysis (DA), data from the survey was assessed utilizing the survey responses and many different risk perception variables. Examples of these perceptual fears and actual challenges encountered included such variables as weather related (blizzards, cold, or high winds), climbing the mountain (rockfall, crowds, seeing injured or dead climbers, falling into a crevasse, dying, or environmental concerns), and physical bodily aspects (suffering from frostbite, dehydration, Acute Mountain Sickness (AMS), or High Altitude Pulmonary Edema). A total of 23 variables were analyzed in order to predict the most common risk perception concerns of climbers across the three overall mountaineering experience level groups. The data was normally distributed prior to the analysis, and generated one function that was significant, $\Lambda = .842$, $\chi^2(2, N=72)=14.86$, $p<.001$, indicating that the function of predictors significantly differentiated between mountaineering experience level groups and their perceptions of particular risk perception variables "before" and "after" their climb of Mount McKinley (Table 2). Risk perception status was found to account for only 14.8% of the function variability for "before" and "after" the climbing trips. Standard function coefficients and correlation coefficients (Table

3) revealed that the variables of fearing AMS, dehydration, HAPE, and not making it to the top were most associated with the function "before" the climb, while dehydration, not making it to the top, high winds, and sunburn/snow blindness were the biggest concerns of groups of climbers

Table 2. Discriminant Analysis (DA) summary of notable variables

Notable Group Differences in the Discriminant Analysis

	Likert Scale Mean Values				
Mount McKinley Climbing Experience/Skill Level Groups	(n=18)	(n=28)	(n=26)		
BEFORE Variables (Fears/Concerns)	**Novice**	**Intermediate**	**Advanced**	**Wilks' Lambda (Λ)**	**Significance**
Fear of AMS	4.77	3.71	3.31	0.842	0.001 *
Fear of Dehydration	5.00	3.29	3.77	0.873	0.016 **
Fear of HAPE	4.77	2.78	3.85	0.875	0.021 **
Fear of Digestive Ailment	4.88	2.93	2.77	0.876	0.025 **
Fear of HACE	4.55	2.79	3.46	0.898	0.071 ***
Fear of Not Making it to the Top	4.66	3.93	3.23	0.908	0.097 ***
Fear of Extremely Cold Temperatures	6.33	5.21	6.69	0.913	0.098 ***
Fear of Avalanches	3.88	2.86	3.46	0.914	0.100 ***
Fear of Sunburn/Snow Blindness	4.77	3.71	3.77	0.929	0.195
Fear of Falling off Cliff or Mtn. Face	4.77	3.86	3.23	0.936	0.335
Fear of High Winds	6.11	4.14	6.23	0.938	0.340
Fear of Suffering from Frostbite	5.77	4.50	4.54	0.949	0.420
Fear of Crowds/too many people on the routes	3.44	4.57	3.77	0.956	0.478
	(n=18)	(n=28)	(n=26)		
AFTER Variables (Problems/Conflicts Encountered)	**Novice**	**Intermediate**	**Advanced**	**Wilks' Lambda (Λ)**	**Significance**
Conflict of AMS	2.88	2.43	1.62	0.949	0.424
Conflict of Dehydration	6.57	5.14	5.15	0.909	0.079 ***
Conflict of HAPE	2.00	1.50	1.23	0.955	0.471
Conflict of Digestive Ailment	3.77	2.50	2.54	0.958	0.490
Conflict of HACE	1.77	1.57	1.23	0.965	0.557
Conflict of Not Making it to the Top	2.00	1.93	1.38	0.912	0.086 ***
Conflict of Extremely Cold Temperatures	3.66	5.00	4.23	0.963	0.534
Conflict of Avalanches	1.77	1.36	2.15	0.916	0.233
Conflict of Sunburn/Snow Blindness	5.66	3.71	3.92	0.875	0.011 **
Conflict of Falling off Cliff or Mtn. Face	2.00	2.29	2.23	0.995	0.914
Conflict of High Winds	3.88	5.71	4.69	0.915	0.098 ***
Conflict of Suffering from Frostbite	2.22	2.36	2.08	0.994	0.909
Conflict of Crowds/too many people on the routes	3.44	3.79	3.85	0.996	0.932

***α < .01 (99%), ** α < .05 (95%), *** α ≤ .10 (90%)**

"after" their climb of Mount McKinley. Based on these findings, the function was labeled "*Health and Environment Influencing Making the Summit*". Original classification results revealed that 100.0% of the *novice* climbers were correctly classified, 92.9% of the *intermediate* climbers were correctly classified, and 100.0% of the *advanced* climbers were correctly classified. For the overall sample, 97.2% were correctly classified. Cross-validation derived only 49.3% accuracy for the total sample. The means of the Discriminant functions are consistent with these results. Novice and intermediate climbers had a function means of .776 and 2.663,

respectively, while advanced climbers had negative function means of -3.405. These results suggest that climbers with high fears of AMS, dehydration, HAPE, and not making it to the top were most associated with the function "before" attempting Mount McKinley are more likely to be classified as *intermediate* (most positive function mean). Novice climbers may also be concerned but not to the degree of the intermediate climbers as indicated by these positive function values. Additionally, these values indicate that "after" a Mount McKinley climb, *intermediate* classified climbers were more impacted and concerned with dehydration, not making it to the top, high winds, and sunburn/snow blindness on their summit bid.

Table 3. Summary of "*Health and Environment Influencing Making the Summit*" function and most predicted associations

Correlation Coefficients and Standardized Function Coefficients

Function: "Health and Environment Influencing Making the Summit"

	Correlation Coefficients with:	
BEFORE Variables (Fears/Concerns)	**Discriminant Function**	**Standardized Function Coefficients**
Fear of AMS	0.369*	0.148
Fear of Dehydration	0.262*	0.028
Fear of HAPE	0.219*	0.123
Fear of Digestive Ailment	0.155	0.153
Fear of HACE	0.146	-0.111
Fear of Not Making it to the Top	0.188*	0.075
Fear of Extremely Cold Temperatures	0.137	-0.100
Fear of Avalanches	0.150	-0.054
Fear of Sunburn/Snow Blindness	0.019	0.029
Fear of Falling off Cliff or Mtn. Face	0.008	-0.006
Fear of High Winds	0.067	0.010
Fear of Suffering from Frostbite	0.123	0.017
Fear of Crowds/too many people on the routes	0.006	0.047
AFTER Variables (Problems/Conflicts Encountered)		
Conflict of AMS	0.082	0.048
Conflict of Dehydration	0.294*	0.185
Conflict of HAPE	0.044	-0.060
Conflict of Digestive Ailment	0.039	0.033
Conflict of HACE	0.001	-0.032
Conflict of Not Making it to the Top	.0155*	0.070
Conflict of Extremely Cold Temperatures	0.069	-0.013
Conflict of Avalanches	0.107	-0.107
Conflict of Sunburn/Snow Blindness	0.166*	0.021
Conflict of Falling off Cliff or Mtn. Face	0.026	0.056
Conflict of High Winds	.0149*	0.080
Conflict of Suffering from Frostbite	0.009	0.042
Conflict of Crowds/too many people on the routes	-0.057	-0.012

*Indicates variables most assiciated with the predicted function 'before' and 'after' the climb, respectively.

D. Climbing Frequency (Crowding), and Success Results

A majority of the climbers surveyed indicated that the level of crowding on the peak remains within acceptable limits (n = 56, 77.7%) for the permit system that is currently in place at Denali National Park and Preserve. 66 of the 72 responding climbers (91.6%) indicated that the current permit system used by National Park Service is adequate and should continue to be used. 14 of the 72 surveyed climbers (19.4%) further indicated that the current permits issued within the system should be decreased, while four climbers (5.5%) suggested an increase in permits for the future. Relationships between an acceptable number of people and the three classified climbing experience/skill levels are shown in Table 4, including two additional questions polled to climbers in regards to potential crowding on Mount McKinley. All three of the climbing groups appear to be content with the level of crowds at the present time, with the advanced climbers holding a slightly smaller percentage than the intermediate climbers, while the novice climbers are close to 90% for accepting the number of people present on McKinley as a whole for their group total.

Table 4. Crowding opinions across the different experience/skill level groups of climbers

Climbing Frequency and Crowding Opinions Across the McKinley Experience/Skill Level Groups

Questions		(n=18) Novice	(n=28) Intermediate	(n=26) Advanced	(n=72) All Groups Total
Is the crowding within acceptable limits for you?	**Yes**	88.8% (16)	78.5% (22)	69.2% (18)	77.7% (56)
	No	11.2% (2)	21.5% (6)	30.8% (8)	22.3% (16)
Are there too many people trying to climb Mt. McKinley?	**Yes**	11.2% (2)	28.6% (8)	38.5% (10)	27.7% (20)
	No	88.8% (16)	71.4% (20)	61.5% (16)	72.3% (52)
Is the mountain too crowded?	**Yes**	11.2% (2)	21.5% (6)	23.1% (6)	19.4% (14)
	No	88.8% (16)	78.5% (22)	76.9% (20)	80.6% (58)

Specific portions of the route were surveyed as well for climber response to potentially crowded locations on the peak (Table 5). Concerns about crowd levels at the Kahiltna basecamp at 7,200'/2195m increased according to the respondents from before the climb to after, with mean scores increasing from 4.61 before to 5.81 after. As climbers got closer to the summit,

the amount of crowding concerns steadily declined from a highest average of 5.81 in Kahiltna basecamp, 4.83 in the 14,200' NPS camp, 4.08 in the 17K camp, 3.35 near the summit from Denali Pass and above, and 2.56 on the summit. Climber's felt that with an average score of 4.55, their experience with McKinley was only moderate to low overall in regards to the crowding. Even though crowding perceptions appear relatively low, further data indicates that nearly 70% of the climbers surveyed were delayed by others over the course of their summit attempts. Climbers waited an average of 2.75 times on the ascent, totaling an average wait time of 26.16 minutes (Maximum 12 times for 60 minutes and minimum one time for 5 minutes). On the descent, climbers waited an average of only 1.14 times for 12.92 minutes (Maximum 15 times for 45 minutes and minimum one time for 10 minutes). Two-thirds of the sample agreed that approximately 1000 people a year and 40 people per day should be permitted to climb any one of the standard routes on Mount McKinley originating from the Kahiltna basecamp and utilizing the West Buttress. A wide range of responses was also seen regarding how many people should be allowed to climb per year (40-5,000) and per day (5-100).

Table 5. Specific responses to crowding concern questions on Mount McKinley

Response to potential crowding for particular locations on Mt. McKinley

Questions (BC = Before Climb) (AC = After Climb)	(n = 72) Likert Mean Score (1-10)	(n = 72) Mode (n,%)
How crowded is Kahiltna base camp? (BC)	4.61	3, (n=20 , 27.8%)
Indicate level of crowding at Kahiltna base camp? (AC)	5.81	4&7, (n=16, 22.2%)
How crowded do you think 14K camp will be? (BC)	5.8	6, (n=18, 25.0%)
Indicate level of crowding at 14K camp? (AC)	4.83	5, (n=20, 27.8%)
Indicate level of crowding at 17K camp? (AC)*	4.08	4, (n=14, 26.9%)*
Indicate level of crowding from Denali Pass and above to top? (AC)**	3.35	2, (n=18, 34.6%)**
If you stood on the summit, how crowded was the experience? (AC)***	2.56	1, (n=18, 36.0%)***
Indicate the level of crowding you felt your climb of Denali was as a whole? (AC)	4.55	5, (n=26, 36.1%)

*n = 52 climbers surveyed made it up to 17k camp.
**n = 52 climbers made it up to at least Denali Pass.
***n = 50 of 72 surveyed climbers made it to the summit (69.4% summit rate).

Question	Yes	No
Did you have to wait for others to ascend or descend from any section of the mountain?	69.4%	30.6%

If yes to ascent/descent waiting and times (n = 50):	Mean	Max	Min
# of times waiting on the ascent:	2.75	12	1
# of minutes waiting on the ascent:	26.16	60	5
# of times waiting on the descent:	1.14	5	1
# of minutes waiting on the descent:	12.92	45	10

	Mean	Max	Min	Mode (n,%)
What is the ideal number of climbers that should be allowed on route per season?	1091	5000	100	1000 (n=48, 66.6%)
What is the ideal number of climbers that should be allowed on your route per day?	22.36	40	5	20 (n= 34, 47.2%)

Before the start of the climb from basecamp for a few people, success only meant making it to the summit (n = 6, 8.4%) while other climbers stated that their expedition would be successful regardless of their bid to get to the top (n = 66, 91.6%). These views changed slightly after the trip was over, as *all* respondents (n =72, 100.0%) stated that their entire trip was a success, with nobody claiming an unsuccessful Mount McKinley climbing trip overall. Other factors may have played a significant role in these responses due to the fact that 50 of 72 respondents (69.4%) made it to the top of North America's highest peak. When asked if they were going to ever return again to climb Mount McKinley, the most common response was 'absolutely' (10 Likert, n=18, 25.0%), while a majority (n=58, 88.5%) indicated they would at least consider coming back someday (5 and above Likert scale response).

Climber confidence in relationship to climbers making the summit is one final result worth mentioning. Before the climb, respondents were asked how confident they felt about making it to the top. The scale was as follows: *completely confident (100%)*, *fairly confident (75-100%)*, *optimistically confident (50-74%)*, *slightly confident (25-49%)*, *not at all confident (0-24%)*. Slight less than half of the climbers (n=32, 44.4%) answered *optimistically confident (50-74%),* and (n=30, 41.7%) answered *fairly confident (75-100%).* Only six climbers (n=20, 8.4%) were *completely confident (100%)*. This majority of the two highest categories before the climb ((*fairly confident (75-100%)* and *optimistically confident (50-74%),* n=62, 86.1%), adequately mirrors the actual number of successful summits by the sample size (n=50, 69.4%). Climber confidence was therefore carried over into the actual summit bid by a group of very determined individuals on a very difficult mountain to climb.

IV. Discussion

A. Crowding Concerns

The following research questions were posed for this study regarding potential crowding:

1. What are the major similarities and differences in the cross-section of the climber demographics on the issue of crowding surveyed on Mount McKinley? Does crowding exist? Is the level of crowding within an acceptable limit for the climbers present?

Addressing the first two questions in #1 above, there are far more similarities than differences in the cross-section of the climber demographics regarding the issue of crowding. As a whole, there appears to be only a moderate to minimal level of crowding perceived by all

climbers, regardless of their demographic backgrounds and climbing experience or expertise. The concerns of overcrowding and negative visitor experience appear to increase with corresponding levels of increasing mountaineering ability (Table 4). It is important to distinguish between 'crowding' and 'overcrowding'. All parties involved predominately agree that there is some 'crowding' occurring (i.e. at specific camps on the mountain), and the crowding impacts need to be managed by the National Park Service. However, because a majority of the climbers believe that the crowding is within acceptable limits, there does not appear to be 'overcrowding' taking place on Mount McKinley from the climbers' perspective. Crowding at the present time is therefore not compromising the 'optimal' visitor experience.

Additional factors are being raised concerning the crowds (e.g. human waste management, trash, erosion). Survey questions polled climbers as to their perception of mentioning 'three most obvious environmental concerns'. Responses ranged from concerns about human waste (n=36, 50% of all respondents), trash (n=9, 12.5%), abandoned caches, global warming, and pollution from both planes (noise) and humans (unnatural presence) on the landscape. Survey results indicate clear concern on McKinley for the environment, and reveal that the NPS personnel should continue to work to mitigate these factors created by volumes of people concentrated on one route corridor. One obvious concern that comes from information from climbers is the overall issue of human waste. One survey respondent stated, "How can the NPS still allow people to throw their 'poo' into a deep crevasse? How can that be safe?" It is certainly true that people are using the CMC's and flying some of the waste off the mountain, but with 1,200 climbers per season on the same area of the mountain, there will inevitably continue to be a very large volume of waste left behind. Open pit latrines at the 14,000-foot camp and deep crevasses at the 11,000 foot camp are just two examples of where mass deposition of waste is taking place every year (Figures 4 and 5). Could solar toilets or any other form of toilet technology be a viable solution to prevent further waste problems? Future research into water quality and tracking the waste in the glaciers may shed light upon how much of a negative impact this continuing policy of the NPS is making upon the glacial environment, and the degree to how much will remain a mystery for many years and only be revealed in due time.

In discussing the crowding issue with recently retired climbing Ranger Daryl Miller, he stated "I don't think that anyone should be turned away from climbing the mountain from any route or camp, we need to keep this mountain open for a great recreational experience for all who

choose to climb, yet we do need all of our Climbing Rangers in place to assist climbers in need". (Daryl Miller, personal communication, May 25, 2009). "The number of people that can come and climb Denali was recently under consideration to be capped at 1,500, but realistically that number is always going to be influenced by the number of available resources. For example, there can only be so many planes, so many days of good weather, and so many opportunities for people to get to the Kahiltna to climb Denali. This number may already be maximized in the 1,200 to 1,500 range." (Daryl Miller, personal communication, May 25, 2009). Mr. Miller also agreed that most of the climbers that attempt the two main routes come because of the other people present. People feel comfort or strength in numbers knowing they can get assistance if they get in trouble, and they also enjoy getting reports about the weather and the route from other climbers camping in the same areas, including the socializing aspects of their trip (Kedrowski 2008).

The two standard routes from each of the main camps are not very technical by modern mountaineering standards, but they are crevassed and you spend a significant part of your climb on glaciers, which can pose many challenging hazards, especially if weather changes or if other factors complicate an ascent or descent. Denali is considered the coldest and most hostile mountain on earth, posing many environmental difficulties. Because only 18 climbers (25.0%) surveyed were considered novice, it is safe to say that most of the more advanced climbers may not be heading to other parts of the mountain to attempt more challenging routes, although you would expect the advanced climbers to also be venturing to isolated parts of Denali. It may also be true that the advanced climbers who took part in this study were there because they were serving as leaders to guide their friends or clients up the mountain in either private independent groups, or as employees of the guiding companies. There are a multitude of factors that lead to why climbers concentrate on the Kahiltna, and these factors could perhaps be topics for future research.

The third question about crowding (from #1 above: Is the level of crowding within an acceptable limit for the climbers present?) can be answered with the results of this study regarding the permit system currently in place. The majority of the respondents at this point think that crowding is relatively minor on North America's highest mountain because 66 of the 72 responding climbers (91.6%) indicated that the current permit system used by National Park Service is adequate and should continue to be used. Only 14 of the 72 surveyed climbers

(19.4%) further indicated that the current permits issued within the system should be decreased. This information clearly indicates that the current permit system is adequate and should continue to be implemented for the people that want to come and climb. The question: "From a climber's perspective, what can be done to manage the existing crowding issues and the permit system on the highest mountain in North America?", can easily be answered here. Additional components of managing the permit system include keeping climbing rangers staffed at the three main camps (Kahiltna BC, 14K, and 17K), requiring the continued use of CMC's, maintaining the *Kahiltna International Airport*, keeping a helicopter present for search and rescue capabilities, frequent ranger patrols, and regular enforcement of leave no trace and other climber ethics for all that visit the mountain and camp along the WB route. As the Discriminant Analysis indicated, the perception of crowds did not increase significantly after the climb as the climbers seemed to become more aware of how many people were present for an attempt of the mountain, but overall their visitor experience was not compromised.

B. Risk/Hazard Perceptions and Relationship to Success on Mount McKinley

The DA was used to address the question: What factors have a significant effect on the mountain climber's perception and actual fears and challenges (hazards/risks) encountered on Mount McKinley 'before' and 'after' a summit attempt? The most obvious findings here are that climbers feared many personal and health hazards associated with being on the mountain in a hostile environment before they began their climb. *AMS, dehydration, HAPE*, and *not making it to the top* were the significant fears for the climbers. *Extremely cold temperatures*, contracting a *digestive ailment*, *HACE*, and fear of *Avalanches* were also noted before the climb, emphasizing that people were quite aware of both environmental and objective hazards and were concerned at possible problems resulting from those conditions. However, a successful summit climb and a positive experience overall for most climbers regardless of experience or skill level made the perception of these risks drop significantly after the climb. Noted hazards of the climb 'before' were not experienced in a negative way for almost all climbers 'during' and therefore the respondents were not concerned with those dangers of climbing Mount McKinley 'after' they made it back to basecamp. Perception of just how much physical strength and personal care towards taking care of oneself in a high-altitude setting was clearly recognized by most climbers following their summit attempt. For example, *dehydration* was still perceived as a concern for

the climbers before they climbed, and they apparently saw the importance of staying hydrated and may have suffered some major problems with dehydration following a rigorous expedition on the mountain. *Sunburn/snow blindness* and *high winds* were noted conflicts encountered after the expeditions by respondents, yet were not mentioned significantly before. Finally, both before and after respondents were concerned about not making it to the top, and because nearly 30% of responding climbers did not make the summit on their expedition, *not making it to the top* was clearly noted as a significant variable in the DA before and after the expeditions.

A moderately high summit rate among participants (69.4%) further impacted these findings as the climbers noted that their trip would be successful even if they did not make the top of McKinley as indicated by 66 (91.6%) of the respondents before they climbed McKinley. Only six climbers indicated that their summit attempt would only be a success if they made it to the top. The relationship between success versus overall climbing experience on Mount McKinley is that out of the 22 climbers that did not make the summit, 11 were novice, nine were intermediate, and only two were advanced. More novice and intermediate climbers did not reach the summit in relationship to the advanced, which may indicate that more experienced climbers have a better chance of getting to the top. Additionally, negative feedback components of the experience were reported only marginally (in only n = 26, 36.1% of respondents), as the most common unsuccessful experience responses were when climbers reported suffering from Acute Mountain Sickness (AMS), blisters from their boots, running out of cooking fuel in camp, a broken piece of equipment, or a lack of fitness level from not training hard enough for the summit attempt. Bad weather was also noted in the responses. Not making the summit is therefore not necessarily viewed as a negative feedback item overall, but more as positive feedback, because it will drive the people to return to climb again, which a majority of the respondents mentioned they would be doing again sometime in the future (n = 55, 88.5%). Perhaps the biggest finding is that there are far more reasons a trip was successful for the climbers besides just making it to the top. Even before making the climb, respondents indicated that their trip would be successful regardless of getting to the top (n = 66, 91.6%). Friendships, camaraderie, socializing, the weather, the beauty, and the views were all reasons for a successful trip independent upon making the summit. These reasons would be the answer to the final research question, which defines success for the Mount McKinley climbers, as all respondents

(n=72, 100.0%), regardless of making the summit, indicated that their Mount McKinley expedition was a success.

V. Conclusion

It is clear that more people returning to climb, and perhaps encouraging new friends to join them for all of the 'success factors' mentioned will continue to have influence on the permit system being maintained by Denali National Park and Preserve. More research needs to be done at the Kahiltna basecamp along the WB route to follow up on the issues presented in this IAR. Larger sample sizes will be necessary to accurately gauge the impressions of the visiting climbers and to ensure that the experience of climbing North America's highest peak remains optimal. This study only included 72 respondents. Paper-based surveys likely hindered the process of collecting data primarily because of logistical reasons. The Kahiltna basecamp is isolated and quite far from the higher camps. Some survey respondents may have lost track of their surveys before and after the expedition and people sometimes do not like to carry anything extra in the backcountry, and therefore were less willing to participate. The rigors of an expedition in such an extreme location may also hinder people from participating. A future solution to this problem would be to survey climbers at the two main camps using palm-pilot technology, and also spend the entire three to four month climbing season at Kahiltna basecamp, to maximize the sample size. By increasing the time collecting data in the basecamps (more than one month), utilizing up to 10 palm-pilot electronic and rechargeable devices, and also eliminating questions that this project found as not relevant, it could be quite possible to obtain sample sizes of nearly 500 respondents. Stamps were also placed on surveys to encourage respondents from later June expeditions to mail their surveys back after their trip. By spending more time at the basecamp, this problem could also be solved. Larger sample sizes would clearly improve the utility of this project, and it would also allow for a comparison of views between climbers in changing seasonal conditions.

At this point, the climbers appear content with the level of crowding. Furthermore, the Mount McKinley Climbing Permit System (MMCPS) is influenced by many factors (Figure 3), but the most important concept to keep in mind is that the number of climbers allowed on the WB route corridor and into the Kahiltna Glacier access point will need to be continually monitored by the Denali National Park officials. There are currently no limits set on the number

of climbers that can be issued a permit to climb Mount McKinley. The NPS has recently capped the permits at 1,500 per season (Federal Register 2008, Pemberton 2005, NPS 2006), and may also look to raise the permit fee from $200 to $500 (Daryl Miller, personal communication, May 25, 2009). The framework described in this paper has not, however, taken into account that there are concerns from climbers as well as a local Alaskan over-flight committee with regards to the negative impact the numerous airplane flights and associated visual and noise pollution are having on the visitor perceptions of climbers on the mountain proper (Figure 6). These components are important to note but were not considered in the full scope of this paper. Global warming and climate change may also become important to climbers because glacial recession can potentially impact routes that are used to scale Mount McKinley. Further research may need to address these important concepts.

Following the conclusion of this pilot study in June 2009, and the description of the dynamics, the number of permits granted to camp and climb Mount McKinley is deemed adequate. The resulting environmental damage (water, human waste, aesthetic value) may take its toll and the National Park Service should consider and continue to monitor the situation through studies such as this and additional studies on more specific environmental concerns. Lowering the amount of permits granted to climb the mountain is likely not a feasible option, mountaineering on North America's highest peak will remain popular, but continuing to educate climbers about LNT principles and the importance of following the rules towards ethical mountaineering will help to mitigate the climbing frequency (Figure 7) and the subsequent environmental strain the mountain needs to sustain for the long haul. I plan on returning to Mount McKinley in the coming seasons to continue to follow up on this framework, and to also assess the perception of the airplane over-flights. I am looking forward to making more conclusions about these topics in the future.

VI. Acknowledgements

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VII. Additional Figures (All Photos by the Author)

Figure 4. Disposing of waste in the 14K camp, using an open-pit latrine over a deep crevasse

Figure 5. 11,000' camp: CMC, pee-hole, and crevasses are all used to deposit human waste

Figure 6. A plane prepares for take-off from *Kahiltna International Airport*. Future research into the impact planes have on climbers on the mountain will be investigated in future seasons

Figure 7. Climbers line up to ascend the headwall on the climb to the West Buttress and 17K camp above the 14K camp on Denali. Level of crowding during this portion of the climb may have potential safety concerns, especially if the weather deteriorates

IX. Appendix (Survey instrument and other documents attached on following pages)

A. Denali Survey Instrument

Your Mount McKinley (Denali) Climbing Trip

What do you think about your experiences?

Texas State Geography
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TEXAS STATE UNIVERSITY SAN MARCOS The rising STAR of Texas

NOTE: THE SURVEY WILL BE ATTACHED SEPARATELY UPON REQUEST OR VIA EMAIL.

B. Texas State University Institutional Review Board (IRB) Approval Documentation

TEXAS STATE UNIVERSITY
SAN MARCOS
The rising STAR of Texas

Institutional Review Board Application

Certificate of Approval

Applicant: Jon Kedrowski

Application Number: 2008D3617

Project Title: Climber's Perceptions on Denali: Climber Demographics, Hazards, and Crowding Concerns

Date of Approval: 11/17/08

Expiration Date: 11/17/09

Assistant Vice President for Research and Federal Relations

Chair, Institutional Review Board

Consent Form: Denali National Park and Preserve Climber's Survey

(Texas State University IRB approval #2008D3617)

Thank you for agreeing to complete this research survey. This survey is being administered by Jon Kedrowski (email: JonJK@txstate.edu), Department of Geography, Texas State University—San Marcos, TX in this research endorsed by the National Park Service. Your time to answer this completely voluntary survey is much appreciated. There may be minimal risks or discomforts involved by participating in this research due to the nature of high-altitude mountaineering. The results of this survey will be provided in the form of scientific research and made readily available to the overall climbing community to help better understand the purpose of this research: addressing the permit system and improving some of the current obstacles and concerns of climbing Mt. McKinley (Denali). The benefit to your participation is the continued management of Denali as a valuable climbing resource. This survey should take no longer than 10-15 minutes to complete, with approximately 30 questions total.

Example Question:

Would you abort your climb to assist in rescuing a fallen or injured climber, even if it meant you were sacrificing your summit bid? (Circle one): Yes No

Informed Consent: You have been chosen to participate in this study because you are attempting to climb Denali. Your answers will be kept strictly confidential and will only be used for the analysis of this study. It will not be given to anyone or used for any other purpose except for this research study. You will not be identified in any way.

Please initial and date below if you agree with this consent to participate in this survey:

Initials _____ Date: _____

Additional Details:

Participants may choose to not answer any question(s) for any reason (this study is voluntary), and will not be discriminated against or biased in any way for declining to answer any questions at any time. Confidentiality of records identifying the participants will be maintained and secured by the NPS in their research and collections database for a period of five years. A summary of the findings will be provided to participants upon completion of the study, if requested. Participants may access results of the study by contacting the researcher, Jon Kedrowski, directly via email approximately 6 months following the completion of the study. At the completion of the computer-based survey, you will be instructed to print this consent document for your records. Also, further pertinent questions about this research, your rights, and/or research-related injuries to you should be directed to the Texas State University IRB chair, Dr. Jon Lasser (512-245-3413 – lasser@txstate.edu), or to Ms. Becky Northcut, Compliance Specialist (512-245-2102).

Researcher Signature_____ Jon Kedrowski, Principal Investigator

Thank you once again, and we look forward to receiving your survey!

Warning: Mountaineering is a high-risk and completely voluntary activity. If at any time this survey has induced additional fear or anxiety in regards to your summit attempt of Denali, the following resources may be of benefit to you:

Anxiety Disorders Association of America
8730 Georgia Ave., Suite 600
Silver Spring, MD 20910
PHONE: 240-485-1001
Email: information@adaa.org

Anxiety Panic Attack Resource Site: www.anxietypanic.com
P.O. Box 1421
Nampa, ID 83653
PHONE: Toll Free (888) 584-7112
E-mail: help@anxietypanic.com

Mayo Clinic
Executive Health and Anxiety Center
200 First Street SW
Rochester, MN 55905
PHONE: (507) 538-3270
Website: http://www.mayoclinic.org/about/

C. Expedition Report for the American Alpine Club

This research expedition was also highlighted by a successful solo summit of Mount McKinley by the researcher (Jon Kedrowski) on May 23rd via the West Buttress route. While this climb was done in addition to the survey and data collection, the researcher also filled out and participated in the survey to add to the database of information collected in the study. Qualitative evaluations of the 'crowdedness' were made on each route, which will also add value and perspective to the overall project, especially when final conclusions were drawn about the data analyzed.

The West Buttress Route for May 2009 was in excellent condition with minimal crevasses, lots of snow, and many other climbers present (Figures A-B). A majority of the crevasses were seen off of the main route and boot track, and a few were navigated carefully. I was able to ski the entire length from the 14K camp down to base camp at the SE fork of the Kahiltna, and completed this ski twice (once after a round of acclimatization to the 14K camp, and once after my solo summit). I started from the Kahiltna BC (7,200'/2194m) on May 15th and arrived in the 14K camp on the evening of May 16th. Following two nights of acclimatizing in the 14K camp, I retreated to the Kahiltna BC on May 18th and spent three nights there resting and eating lots of food, while also overseeing my research study. During these days a powerful storm raged on the upper mountain from the 18th to the afternoon of the 21st. On the early morning of May 21st, I headed back up the mountain and rested in the 11K camp overnight (Figure C). The weather improved and on the 22nd I made a quick four hour climb up to the 14K camp, arriving there around lunch time. I rested again the afternoon of the 22nd, and made preparations to attempt the summit from the 14K camp on May 23rd.

I awoke to clear skies but reasonably high winds on the higher mountain the morning of May 23rd. Temperatures in the mountain's shadow were about 20 degrees below zero Fahrenheit. I left the 14K camp at about 830am, and started up the headwall in frigid shade to gain the West Buttress at 16,200' by 1015am in the warming sun and arrived in the 17K camp by 1130am. After leaving my pack, harness, extra heavy over-boots, and extra water and food behind a snow wall, I placed a water bottle, King-size Snickers bar and camera in my pockets. I took my radio from my pack before I continued up the Autobahn to Denali Pass with one trekking pole and my ice axe just before Noon. While heading up the Denali Pass at 18,200', winds increased and I passed two climbing rangers (Joe was the name of one), three Korean climbers, and two Italian

climbers. All these parties turned back before the Pass, but I continued on. The windiest conditions were gusting winds up to 80-90 MPH through the Denali Pass Saddle, which I encountered at about 115pm. Once I got above the main part of the pass, the Winds weakened to occasional gusts of 20-30MPH. I headed up the ridge, passing Archdeacon's Tower by 230pm and reached the Football Field by a little before 3pm. While in the Football Field I retrieved a small blue camera case believed to have been lost by the Colorado Climber Dr. Gerald Myers on May 19th. I pushed on. Winds were coming from the East directly over the summit, so as I headed up Pig-hill, the winds abated completely. Once step at a time I crested the final ridge by 415pm (Figure D), carefully crossed the narrow cornices of the summit ridge in gusting winds and spin-drift, and found myself on the true summit at 6194m by 440pm on Saturday May 23rd. I was the first person on the summit for the day and the only person to top out for the day. I took some photos of the USGS benchmark and a few of myself using my timer (Figures E,F,G) and began my climb back down by 5pm. I descended relatively quickly, snapping photos all along the return route, including the remains of a make-shift shelter of snow and ice that may have been used by Dr. Myers on the days prior to his disappearance on the 19th or 20th. I was back in the 17K camp by 630pm (Figure H) and back to 14K camp just before 830pm, completing my summit climb successfully in a little less than 12 hours.

On the morning of the 24th I skied back down to BC on the SE fork of the Kahiltna in a mere 5 hours, reaching the camp by about four in the afternoon. I spend the rest of the next few weeks administering the surveys and collecting the surveys for this study. I also had the opportunity to assist in a rescue of a climber named Kurt on May 26th who had a heart attack on the mountain near Kahiltna Pass (Figure I). Bad weather kept the helicopter grounded and so I assisted in bringing supplies up the glacier in a blizzard to assist NPS Rangers with the evacuation of Kurt back to BC so he could be treated and flown out once the weather improved. Other days included skiing and climbing peaks near BC and also spending time doing my surveys for the project and interacting with climbers. All told, an incredible location for a research project!

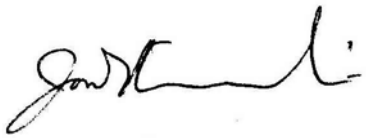
Additional requirements of this research grant awarded by the AAC are slated to be met in the coming months in supplementation to this written expedition report, including:

1. Mention of the AAC (including logos in my PowerPoint) during any of my oral paper presentations in professional conferences at which I present this research.

2. Acknowledgment of the AAC and funding in my peer reviewed written articles and NPS Investigator Annual Reports (IAR) generated from this project.
3. Notification and distribution to the AAC of any articles written and published from this project.

I really appreciate the help from the AAC in funding this project in collaboration with Denali National Park and Preserve my institution, Texas State University—San Marcos. We will be in touch in the future!

Best Regards,



Jon Kedrowski, Research Director

PHOTOS BY THE AUTHOR ON FOLLOWING PAGES

A. Jon Kedrowski in Kahiltna BC where the surveys were administered

B. Heading up the Kahiltna Glacier to higher camps, the Denali Massif is seen here

C. Camp at 11,000' on the afternoon of May 21st during the summit attempt from BC

D. A View of the true summit of Denali from the ridge crest at 430pm on May 23rd

E. Pickets and small monument marking the true summit at 440pm on May 23rd

F. A self-portrait shot in increasing winds at the summit at 445pm May 23rd

G. USGS benchmark just below the true summit on May 23rd

H. West Buttress at 17,000' during the descent to 14K camp (seen near the rocks in the lower left of the photo) at 645pm on May 23rd

I. Assisting with NPS climbing rangers during the rescue and evacuation of "Kurt" from the 7,800' camp 6 miles up the Kahiltna glacier (May 26th, 2009)