DISSERTATION

MESSAGING AND NATIONAL PARK VISITOR ATTITUDES

Submitted by

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ABSTRACT

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National Park Service annual visitation is approaching 300 million, and managers must balance internal stress, such as visitor use, and external stress, such as noise from aircraft overflights, while protecting resource and social conditions. Attitudes affect visitor perceptions of these influences, and largely determine behaviors via behavioral intentions. The purpose of this dissertation is to evaluate national park visitor attitudes, specifically in regard to Leave No Trace minimum impact practices, alternative transportation, and soundscapes, and to increase understanding of effective strategies, such as educational messaging, which can alter visitor attitudes, perceptions and behaviors.

This dissertation summarizes three studies and is presented as three journal articles suitable for submission to tier one or two journals. It begins by describing the origins of visitor capacity in national parks, and the associated frameworks and theoretical models that assess visitor perceptions and assist with the creation of effective messaging. The Theory of Planned Behavior and the Elaboration Likelihood Model are introduced as pertinent frameworks to the development of effective messaging which can alter visitor attitudes and perceptions. Chapters two and three present studies which evaluated visitor attitudes in NPS units, and chapter four builds upon this understanding by testing theoretically-based messaging with park visitors to determine if messaging can alter perceptions. Chapter five connects these studies by discussing how messaging can be applied in parks to alter visitor attitudes, perceptions and behaviors, while suggesting implications of the results and recommendations for future research.

Study one investigates day-user and backcountry-overnight visitor attitudes concerning Leave No Trace at Rocky Mountain and Olympic National Parks. Leave No Trace is the most prominent educational message used to influence behaviors of protected-areas visitors with the end-goal of sustaining or improving resource conditions. The majority of previous research regarding Leave No Trace has focused on backcountry-overnight visitors. However, day-users are by far the largest user group of protected areas, and yet, research focused on this large and growing segment of users has been neglected. The purpose of this study was to enhance understanding of day-user knowledge, awareness and perceptions, and attitudes regarding Leave No Trace and compare them with those of overnight users. Greater understanding of the similarities and differences between these two user-groups is essential so that management can improve efficacy and create effective messaging strategies that alter behaviors and curb depreciative actions.

Study two examines visitor attitudes toward alternative transportation systems in Rocky Mountain and Yosemite National Parks. The National Park Service is increasingly using alternative transportation to accommodate escalating visitation, while reducing the reliance upon personal vehicles that have attributed to resource and social condition impacts. Understanding of visitor perceptions of alternative transportation is vital for managers so that they may develop effective management strategies, frameworks, and messaging concerning alternative transportation use, yet little is known about visitor attitudes toward these systems. The purpose of this study was to examine visitor attitudes toward the alternative transportation experience and to determine salient

variables that can be applied to user capacity frameworks, communication strategies, and park planning.

Study three explores the role of educational messaging on visitor perceptions of military aircraft sounds in Sequoia National Park. Mandates require that the National Park Service protect natural soundscape, and research suggests that opportunities to experience natural sounds are among the most important reasons for visiting parks. Aircraft overflights are a significant source of anthropogenic noise intrusion in parks, and studies suggest that visitors frequently find these events annoying and unacceptable. The National Park Service must integrate methods to mitigate these impacts, and the purpose of this study was to evaluate the role of educational messaging and to determine if this information can significantly affect visitor acceptability of military aircraft sounds by altering visitor expectations.

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DEDICATION

I would like to dedicate this dissertation to my family. My wife, Patricia, my dog, Yoshi, and my parents, have supported me with this endeavor through both the good and bad days and nights, and I want you to know that I could not have done this without you. Patricia, your patience, love, compassion, and of course, monetary support have been vital to my success. I know you are as relieved for me to have finished this process as I am, and I appreciate all of the sacrifices you have made to contribute to my success. I love you. Mom and Dad, both of you are teachers, and I believe you instilled that passion for learning and teaching in me. You've made countless trips across the country to see us and support me, while I worked to complete this process. I cannot thank you enough for your love, encouragement and general life-decision suggestions and discussions. I am proud to be your son, and proud to have you as my parents. I love and appreciate you more than you'll ever know. My loving family, I honestly feel as if we have completed this dissertation together.

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CHAPTER 1

Informing Park Management with Social Science

Introduction

National Park Service (NPS) must adhere to dual mandates that require the protection of natural and cultural resources, as well as preserving the enjoyment of those resources (NPS Organic Act, 1919), while accommodating increasing visitation. This balancing act requires the NPS to manage internal factors, such as escalating visitor use, and external influences, such as noise from aircraft overflights, while maintaining resource and social conditions. Visitor use is often managed under the premise of user capacity, and relies upon finding symmetry between visitor use and resource protection. User capacities rely on frameworks, which set in motion efforts to monitor changes to resource and social conditions, and take management actions as needed to mitigate impacts. Capacities can change depending upon how visitors behave, and behaviors are largely guided by visitor attitudes toward the action in question. Managers apply either direct or indirect management to alter visitor behaviors. Direct management relies upon enforcement of rules and regulations, while indirect management applies information, education, and persuasion techniques to influence visitor behavior. Indirect management in the form of educational messaging is one approach that can implemented to change visitor attitudes, perceptions and evaluations. The purpose of this dissertation is to evaluate visitor attitudes toward a number of variables (each one addressed by different studies) and to increase understanding of the potential for managing visitor perceptions with educational messaging. This chapter introduces the concept of user capacity, and

the frameworks and theories that assist park managers in protecting and preserving park resources and visitor experiences.

The Theory of Planned Behavior and the Elaboration Likelihood Model are introduced as pertinent frameworks to the development of effective messaging which can alter visitor attitudes and perceptions. Finally, background information and relevant research concerning Leave No Trace, alternative transportation systems, and soundscape management in parks are introduced, which will be discussed through individual studies within chapters two, three and four.

User Capacity

Parks and protected areas have experienced rapid increases in visitation since the end of World War II. While this trend has moderated over the past decade, statistics suggest that visitation is again elevating, with nearly 300 million visitors to National Park Service (NPS) units alone within the past couple of years (NPS Statistics 2011). It is recognized that with even low-levels of use, resource degradation occurs (Hammitt & Cole, 1998; Leung & Marion, 2000), and intensive park visitation can cause severe ecological impacts like soil compaction and erosion, water pollution, and wildlife disturbances, and can produce social impacts like crowding, conflict and aesthetic degradation, as well as changes to the managerial environment (Manning, 2007). These issues have been examined within the fields of recreation ecology and natural resource social science through the concept of carrying, or user capacity. There are three dimensions of user capacity that must be considered including the features of the resource (e.g., the ecological characteristics), the managerial components of the resource (e.g., the directives and policies that determine infrastructure), and the experiential factors

associated with visitors (e.g., the social aspects such as motivations, expectations and the amounts of use) (Manning, 2007).

The NPS defines user capacity as "the type and extent of use that can be accommodated while sustaining the quality of park resources and visitor opportunities consistent with the purposes of the park" and suggests that this is accomplished by following a capacity framework (NPS Planning Sourcebook – Visitor Use, 2006). A total of ten user-capacity frameworks were created and implemented in the 1980s and 1990s to address user capacity in parks and protected areas (Haas, 2004). Manning (2007) provides several examples including the Visitor Impact Management (VIM) (Graefe, Kuss, & Vaske, 1990), the Outdoor Recreation Management Framework (Manning, 1999), the Carrying Capacity Assessment Process (C-CAP) (Shelby & Heberlein, 1986), and the Visitor Activity Management Process (VAMP) (Environment Canada and Park Service, 1991), all of which vary slightly depending upon the governing agency, and are considered to have similar foundations and guiding principles (Whittaker, Shelby, Manning, Cole, & Haas, 2011). Limits of Acceptable Change (LAC) and Visitor Experience and Resource Protection (VERP), which was an adaptation of the LAC process, (National Park Service, 1997) are two of the most widely-applied frameworks and have very similar steps and elements (Manning, 2007). LAC (Stankey et al., 1985) was implemented in the Bob Marshall Wilderness in the late 1980s in an effort to curb resource impacts and meet user-capacity mandates set forth by the 1976 National Forest Management Act (NFMA) (Cole & Stankey, 1997). VERP (Manning, 2001; National Park Service, 1997) was applied in NPS units, the first of which was Arches National Park, and is still used to guide user capacity processes in park units today. The VERP

framework relies upon the identification of specific indicators and standards, the development of an ensuing monitoring strategy, and the identification of an appropriate management action if standards are reached or exceeded (Figure 1.1) (Manning, 2001; National Park Service, 1997). This process relies heavily upon science to assist in appropriately identifying indicators and standards.

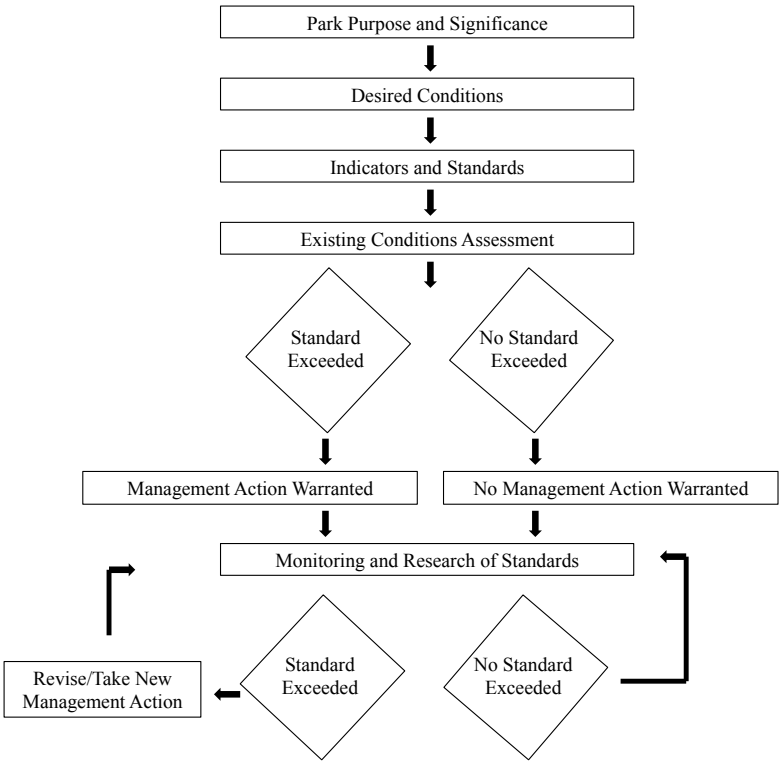


Figure 1.1: VERP User Capacity Decision-Making Framework

Indicators and Standards

The user capacity process requires that managers determine how much change should be allowed within the environmental resources, recreation experiences and the resulting management actions. The social aspects of user capacity rely upon the concept of quality, as it pertains to the condition of the visitor experience. The level of quality is based on the identification of specific indicators and standards, the development of an ensuing monitoring strategy, and the identification of appropriate management actions if

standards are reached or exceeded. This process is determined by evaluating descriptive (focusing exclusively on unbiased data) and evaluative (subjective measure) components of visitor experiences, so that management objectives (desired conditions) and ensuing indicators and standards of quality can be established (Manning, 2007). Indicators are "quantifiable proxies or measures of management objectives" while standards, "define the minimum acceptable condition of indicator variables" (Manning, 2007, p. 23). For example, if an indicator was determined to be the number of social trails experienced per mile, and the number of encounters exceeded the established standard, 3 trails per mile for instance, the quality of a visitor's experience may be depreciated.

Standards are typically evaluated in user capacity research by addressing visitors' norms concerning a given issue. Norms are useful for establishing management goals by defining the attributes in a preferred recreation area (Shelby, Vaske, Donnelly, 1996). This can be evaluated through the social norm curve (Figure 1.2), which is frequently examined by determining "acceptability" of a given issue, (e.g. social trails), based on a 9-point acceptability scale. The highest point on the curve represents the preferred condition, and the amplitude of the curve indicates the salience of the norm (Manning, 2007). The point at which the curve of any given normative measure (e.g., visitor behaviors, ecological impact, people at one time, natural and anthropogenic sound levels) drops below the 0 point on the y-axis, it is perceived as unacceptable. While managers may not care about each individual's standard, crystallization can inform managers about the level of agreement or consensus about the norm (Manning, 2007).

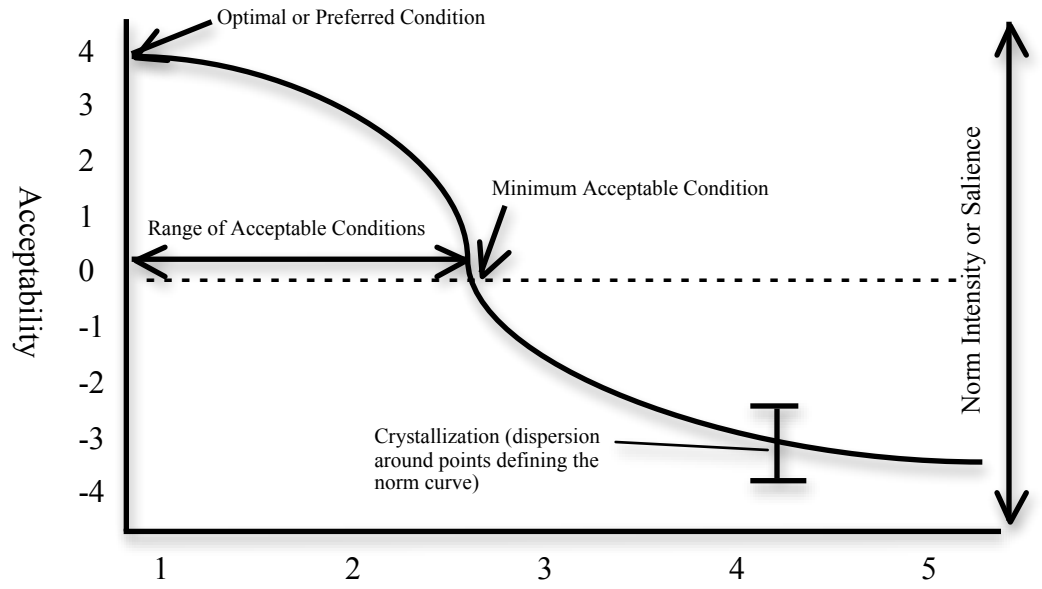


Figure 1.2: Hypothetical Social Norm Curve (concept adapted from Manning, 2007)

If standards are reached or exceeded, adaptive management actions may need to be implemented to maximize visitor experiences while minimizing resource impacts. Recreational user capacity processes have evolved and developed due to environmental planning, legal proceedings, management practices, and recreation research related to visitor capacities (Whittaker et al., 2011), and rely heavily upon indirect and direct management strategies to preserve and protect resource and social conditions.

Direct and Indirect Management

As part of the user capacity framework, monitoring and management actions are implemented if standards are reached or exceeded. Park managers can apply either direct or indirect management to address impacts. Direct management relies upon enforcement of rules and regulations, while indirect management applies information, education, and persuasion techniques to influence visitor behavior. While both forms of management

can be beneficial, indirect management is often preferred because it allows visitors the freedom to choose their actions (Lucas, 1982, 1983; Hammit & Cole, 1998; Hendee & Dawson, 2002; Manning, 2007; Marion & Reid, 2007). Educational messaging is a prominent form of indirect management that can affect visitor perceptions and actions in various ways (Manning, 2003), from curbing depreciative behaviors to influencing visitor attitudes and evaluations of park settings. However, educational messaging cannot be effective without determining how visitors perceive the attributes of their experience.

Theory

Theory aids in understanding cognitive behavioral processing and provides foundations for structuring research which assists in formulating messaging that can influence attitudes, perceptions and behaviors.

The research described within this dissertation applied the Theory of Planned Behavior (TPB) (Ajzen, 1985; 1991) and the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1981; 1986) in order to better understand visitor attitudes pertaining to Leave No Trace, alternative transportation systems, and military aircraft sounds. Ultimately, the goal is to improve understanding of effective messaging strategies that could be applied within a national park setting.

Theories of Reasoned Action and Planned Behavior

The Theory of Planned Behavior (TPB) (Ajzen, 1985; 1991) can be considered as a continuation of its predecessor, the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). The TPB and TRA suggest that an individual's behavior is largely predicated upon the individual's intention to engage in that behavior. The TRA posits that behavioral intention is dependent upon an individual's attitude and subjective norms

concerning the behavior in question (Ajzen & Fishbein, 1980). An 'attitude' is the "psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (Eagly & Chaiken, 1993, p. 1). Subjective norms refer to an individual's perception of how others feel about the behavior in question. The TRA suggests that attitudes are predicated upon an individual's behavioral beliefs (i.e., salient beliefs relevant to the behavior) and evaluations of the outcome of a given behavior, while subjective norms are determined by an individual's normative beliefs (i.e., perceptions of how others feel about the behavior) and the motivation to comply with the perceived evaluations of others. Ham (2007) clarifies that "attitudes are not the same as beliefs" because a "belief describes what 'is', an attitude describes what a person feels about it, whether it's good or bad, right or wrong, positive or negative" (2007, p. 2).

The TPB was developed as an extension to TRA "made necessary by the original model's limitations in dealing with behaviors over which people have incomplete volitional control" (Ajzen, 1991, p. 181). Building upon TRA, in addition to an individual's attitudes and subjective norms, TPB adds the element of perceived behavioral control as another determinant of behavioral intention (Figure 1.3). Perceived behavioral control is an individual's perception concerning their ability to perform a given behavior (Ajzen, 1991). Perceived behavioral control can also be thought of as an individual's perception of ease or difficulty with regard to a particular behavior (Eagly & Chaiken, 1993). To provide applicable understanding of TPB, to assess a visitor's attitude, a social scientist may ask a park visitor how appropriate or inappropriate it would be to approach wildlife to take a photo. Evaluation of a visitor's subjective norm may be determined by asking what a visitor feels others would think if they were to

approach wildlife to take a photo. Perceived behavioral control may be evaluated by asking a visitor the level of control they have over their actions while hiking in a park.

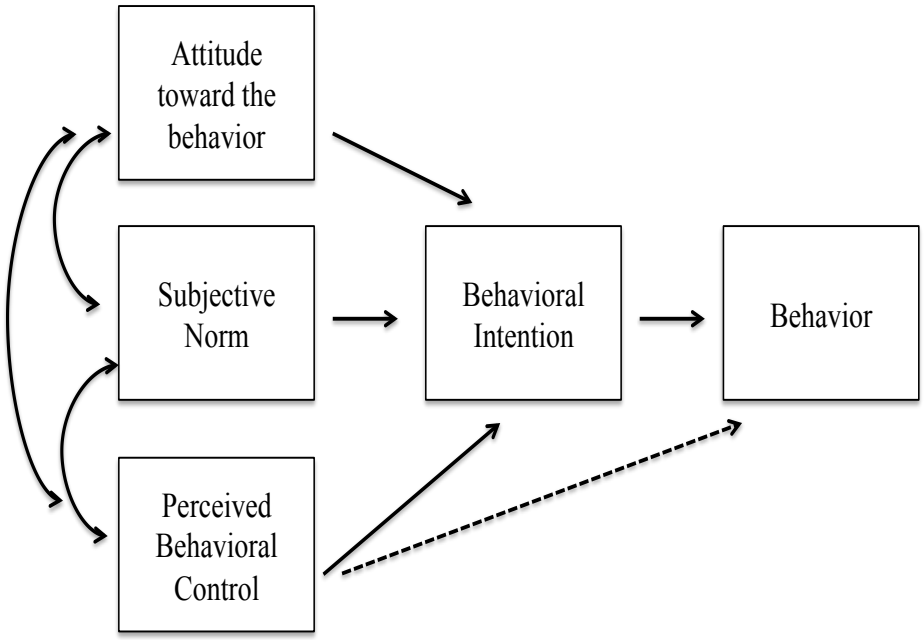


Figure 1.3: The Theory of Planned Behavior (Ajzen, 1991)

While the TPB has been useful for numerous recreation-related studies, critics of the theory have pointed out its inability to consistently predict and explain behaviors, and suggest that perceived behavioral control is only causal to intentions when behaviors are perceived positively (Hale, Householder, & Greene, 2002). That is, if an individual negatively perceives a behavior, yet still feels as though they have control over it, they may not intend to follow through with the behavior in question. For the purposes of this dissertation, the strength of the TPB lies in its ability to target an individual's beliefs and attitudes, with which persuasive messages can be formulated that are aimed at changing behavioral intent (Ham & Krumpe, 1996).

Elaboration Likelihood Model

The Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1981; 1986) is one of the most prominent theoretical models applied to influence visitors in parks and protected areas (Absher & Bright, 2004), and has been applied to evaluate the effect of information on attitudes in numerous natural resources-based studies (Bright, Teel, Manfredo, & Brooks, 2003; Manfredo & Bright, 1991; Tarrant, Bright, & Cordell, 1996; Teel, Bright, Manfredo, & Brooks, 2006). The model postulates that there are two routes to persuasion: the central, which likely occurs through thoughtful, motivated consideration of information, and the peripheral, which induces change without perusal of information (Petty & Cacioppo, 1986). The model focuses upon the processes by which message features influence attitudes (Booth-Butterfield & Welbourne, 2002) by better understanding the level of elaboration (i.e., extent to which a message is scrutinized) that a particular communication strategy has upon an individual (Petty & Cacioppo, 1986). Perhaps most importantly, altered attitudes stemming mostly from "processing-issue-relevant arguments (central route) will show greater temporal persistence, greater prediction of behavior, and greater resistance to counter-persuasion than attitude changes that result mostly from peripheral cues" (Petty & Cacioppo, p. 21, 1986). Figure 1.4 demonstrates the potential persuasion processes that can occur after exposure to messaging.

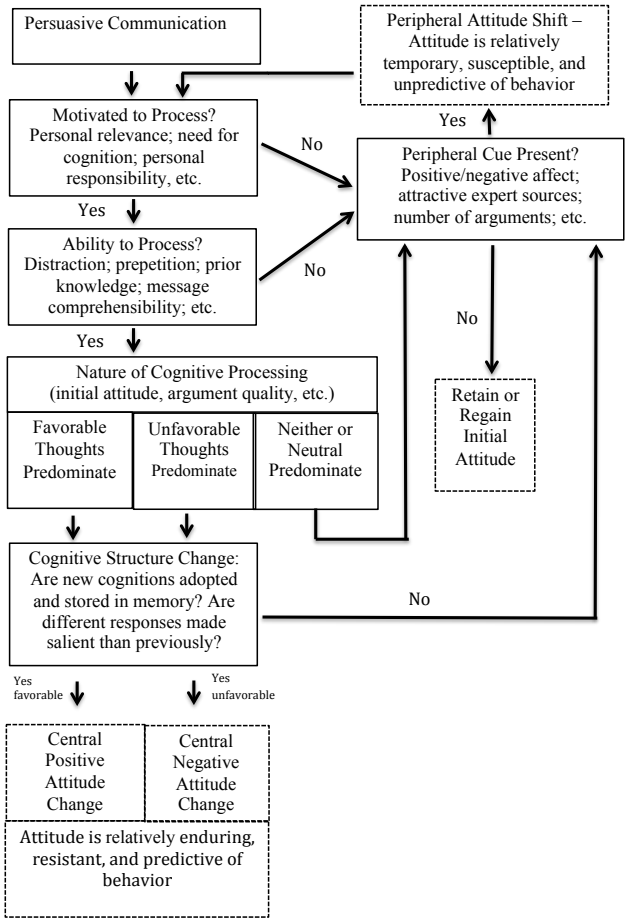


Figure 1.4: Elaboration Likelihood Model (Petty & Cacioppo, 1986)

The model suggests that there are several factors that influence persuasion, and over the past three decades, numerous studies have advanced understanding of these postulates. These factors involve the recipient and the argument or message, and include a) motivation, b) variations in elaboration, c) how variable variation affects attitudes, d) relatively objective message processing, e) relatively biased message processing, f) elaboration versus peripheral cues, and g) consequences of elaboration (Petty & Cacioppo, 1986). Variable variation can influence attitudes through strong or persuasive arguments, which target an individual's intuitive feeling toward a particular position through peripheral cues, subsidiary signals, and through actual elaboration, which affects

motivation (Eagly & Chaiken, 1993; Petty & Cacioppo, 1986). If a recipient is processing through central route, either objective reasoning or biased processing takes place, which can be affected by cognitive factors. Through objective reasoning, an individual considers the message in an impartial or unbiased manner (Petty & Cacioppo, 1986), while biased processing, which can result in purposeful counter-persuasion, is most likely to occur when an individual has vested interest in the information topic (Booth-Butterfield & Welbourne, 2002; Perloff, 2003; Petty & Wegener, 1999).

Educational communication strategies in parks often rely on central route processing (Marion & Reid, 2007), but situational and personal variables like motivation, message relevancy, potential distractions, ability, previous experiences, and knowledge all affect the level of elaboration, and determine whether central or peripheral processes occur (Booth-Butterfield & Welbourne, 2002; Perloff, 2003; Petty & Cacioppo, 1986). It is unrealistic to motivate central processing within every visitor, because it is "inevitable that people will rely on mental shortcuts" and instead process through peripheral route (Perloff, 2003, p. 129). Therefore, effective messaging design requires consideration of variables that are thought to enhance and motivate understanding such as personal relevance, personal responsibility, the number of messages, and message sources (Petty & Cacioppo, 1986), while also considering factors that may inhibit attitude change. For example, Manfredo & Bright (1991) found that elaboration was affected by source credibility (i.e., information from the United States Forest Service) and also determined that respondent's prior knowledge had a strong effect on elaboration and acquisition of new beliefs. While interpretive strategists cannot always reach visitors due to situational and personal variables, developing messages that are strong and impactful, by making

them relevant to the visitor (Ham, 2007; Ham et al., 2009), may lead to more central route processing.

Strong messages, or messages that contain substantial argument quality, can stimulate and enhance elaboration (Petty & Cacioppo, 1986; Petty & Wegener, 1998; Wood, 2000). Strong messages provide relevant, reasonable, quality information that can be used to influence attitudes. Alternatively, weak messages lack argument strength and therefore are not as effective in triggering elaboration or altering attitudes (Petty and Cacioppo, 1986; Petty & Wegener, 2008). Attitudes that align or *match* with presented information are thought to be strengthened with strong arguments, while recipient attitudes that *mismatch* may not change if the message does not have the strength to stimulate elaboration (Petty & Wegener, 2008; Lavine & Snyder, 1996; Wood, 2000; Ziegler, Dobre, & Diehl, 2007). Furthermore, framing arguments to trigger recipient values or goals increases elaboration potential, and the likelihood of attitude change (Wood, 2000).

The model has been criticized for not specifying if central and peripheral processing can act concurrently (Eagly & Chaiken, 1993; Todorov, Chaiken, & Henderson, 2002), and for not providing a deeper level of understanding concerning argument construction; instead, the model relies upon the researcher to explore attitudinal arguments based upon argument quality and strength of persuasion (Booth-Butterfield & Welbourne, 2002). For the purposes of this dissertation, ELM imparts a foundational understanding of how messages are received and processed, and therefore provides guidance in message construction. By applying both the TPB and ELM, we can strengthen the effectiveness of a given persuasion strategy (Ham et al., 2009). Use of

TPB can direct us toward the most effective message content (based on salient beliefs and attitudes), while ELM can aid in determining a strategy that will give messages impact.

The following sections of this chapter provide background information concerning Leave No Trace (LNT), alternative transportation systems (ATS) in national parks, and soundscape management. This information can assist park managers with the user capacity process, particularly through indirect management in the form of theoretically-driven educational messaging.

Leave No Trace

Protected areas received dramatic increases in visitation during the 1960s which led to a greater awareness of resource and social impacts, resulting in the development of several indirect management-based educational campaigns such as "Wilderness Manners," "Pack it in – Pack it out," "Wilderness Ethics," "Minimum Impact Camping," and "No-Trace Camping" (Marion & Reid, 2001). Jim Bradley's (1979) influential paper further encouraged these efforts by suggesting that a purely regulatory approach in managing recreation impacts antagonized visitors rather than gaining their support, because most impacts were the result of lack of knowledge, not malicious intent. Instead, he advocated that educational approaches would be more effective and appropriate, because regulation could not occur everywhere at all times (Bradley, 1979; Marion & Reid, 2001). This acknowledgement that educational programs would better serve the purpose of reducing impact, led to a more formalized "No-Trace" program in the early 1980s, followed by an interagency collaborative effort in 1987 between the U.S. Forest Service (USFS), the NPS, and the Bureau of Land Management (BLM), to develop and

distribute an educational pamphlet titled “Leave No Trace Land Ethics” (Marion & Reid, 2001).

The USFS formed a partnership with the National Outdoor Leadership School (NOLS) in 1991 and began implementing a science-based approach to evaluating minimum-impact recreation through the field of recreation ecology, which focuses upon the impacts recreational activities have on the ecological aspects of our natural resources (Hammitt & Cole, 1998; Cole, 2004; Leung & Marion, 2000; Monz, Cole, Leung & Marion, 2010). This collaboration led to the development of programmatic ethics and experiential training efforts, which increased the effectiveness, and improved awareness of the Leave No Trace (LNT) campaign (Marion & Reid, 2001). In 1994, a new memorandum of understanding was signed between the USFS, NPS, BLM and NOLS with the focused mission of LNT becoming a nationally-recognized minimum-impact educational campaign aimed at educating wildland visitors with science-based materials and courses (Marion & Reid, 2001). Also in 1994, with the support of the partnering federal lands agencies and outdoor retailers, LNT became a registered nonprofit organization, which is now known as the Leave No Trace Center for Outdoor Ethics. The LNT Center now promotes stewardship-based ethics through various educational initiatives in federal, state, city, county and international protected areas. The seven Principles, (Figure 1.5) which the organization promotes, can be seen in most protected areas trailhead signage and promotional materials.

Figure 1.5: Leave No Trace Principles

LNT-Related Social Science Research

The field of recreation ecology is largely responsible for establishing and assisting with the development of the LNT program. This field of study has dominated most minimum-impact research, and reviews suggest that there have been over one thousand recreation ecology articles published within recent decades (Monz, et al., 2010). However, natural resources social science, which focuses on the sociological, psychological, cultural and economic aspects of the recreationists, (Ewert, 1996) is relatively scant with regard to LNT-related research. The majority of social science research related to LNT has evaluated educational efficacy through various communication strategies in an effort to increase knowledge and influence behavioral change (Marion & Reid, 2007).

In order for the LNT Center to successfully instill an ethic of stewardship among visitors, the LNT message must be effectively disseminated. Previous research has applied and evaluated various forms of media for message dissemination (Marion & Reid, 2007), and effectiveness has varied depending upon the message source, audience

and content. Trailhead bulletins, posters, trail-side signs, and signs near the potentially problematic area have been found to be advantageous (Cole, Hammond, & McCool, & 1997; Duncan & Martin, 2002; Hockett, 2000; Hocket & Hall, 2007; Jacobi, 2003; Johnson & Swearington, 1992; Martin, 1992; Stewart et al., 2000; Stubbs, 1991; Thorn, 1995; Widman, 2010; Winder & Roggenbuck, 2000; Winter, 2006), while informational brochures and guidebooks, (Huffman & Williams, 1987; Lackey & Ham, 2003; Manfredo & Bright, 1991; Martin, 1992; McAvoy & Hamborg, 1984; Oliver, Roggenbuck, & Watson,1985) and interpretive displays or exhibits (Fazio, 1979) have also proven to be effective forms of communication. Personal contact, whether from a park employee, uniformed volunteer, other visitor, or interpretive skit have also proven to be beneficial (Fazio, 1979; Hendricks, 1999; Hendricks, Ramthun, & Chavez, 2001; Kernan & Drogin, 1995; Oliver, et al., 1985; Stewart, et al., 2000; Widner & Roggenbuck, 2000).

Regardless of the approach, it has been suggested that delivery of the message should be clear and concise, occur early in the visitor's planning process, (Cole, et al., 1997; Douchette & Cole, 1993; Lime & Lucas, 1977; Lucas, 1981; Roggenbuck & Berrier, 1982; Stewart et al., 2000) be reinforced and timely near potential problematic areas, (Hockett, 2000; Hockett & Hall, 2007; Widman, 2010; Widner & Roggenbuck, 2000) and not provide so much information that the receiver is overloaded (Cole et al., 1997). Messages should be based on theoretical frameworks (Manning, 2003; Marion Reid, 2007), should target salient beliefs and attitudes by making content relevant (Ham & Krumpe, 1996), and should strive to be contextually specific (Vagias, 2009). Generally, a range of media approaches is thought to be best (Ballantyne & Hughes,

2006; Manning, 2003; Marion & Reid, 2007). Although few studies have explored computer-based dissemination, (Griffin, 2004; Huffman & Williams, 1987; Newman, Lawson, & Monz, 2011; Powell, Wright, & Vagias, 2008; Vagias, 2009) in an age of Facebook, Twitter and other Internet communication forums, this remains a viable option for additional dissemination (Marion & Reid, 2007).

Most previous minimum-impact or LNT research has addressed acquisition of knowledge or current knowledge state (Cole et al., 1997; Confer, Mowen, Graefe, & Absher, 2000; Daniels & Marion, 2005; Dowell & McCool, 1986; Fazio, 1979; Jones, 1999; Jones & Bruyere, 2004; Leung & Attarian, 2003; McAvoy & Hamborg, 1984; McCool & Cole, 2000; Newman, Manning, Bacon, Graefe, & Kyle, 2003; Reuhrwein, 1998; Stewart, et al., 2000; Stubbs, 1991; Thorn, 1995; Vagias & Powell, 2010), behavioral intentions to comply with recommended behaviors, (Christensen & Cole, 2000; Dowell & McCool, 1986; Duncan & Martin, 2002, Hendricks, 1999; Stubbs, 1991; Trafimow & Borrie, 1999) behavioral change, (Ballantyne & Hughes, 2006; Cialdini et al., 2006; Daniels & Marion, 2005; Gramann &Vander Stoep, 1986; Hendricks et al., 2001; Hockett, 2000; Hockett & Hall, 2007; Johnson & Swearingen, 1992; Kernan & Drogin, 1995; Marion, Dvorak, & Manning, 2008; Martin, 1992; Mertz, 2002; Oliver et al., 1985; Park, Manning, Marion, Lawson, & Jacobi, 2008; Schwartzkopf, 1984; Stubbs, 1991; Vagias, 2009; Widman, 2010; Widner & Roggenbuck, 2000; 2003; Winter, 2006) and resource changes following intervention techniques (Jacobi, 2003; Oliver et al., 1985; Reid & Marion, 2004; Widman, 2010). Most previous research has shown that educational strategies have improved knowledge concerning minimum-impact practices, or have positively influenced behavioral intent and behaviors to comply with

recommended conduct. This suggests that LNT-related educational strategies are effective (Marion & Reid, 2007).

Despite numerous studies concerning depreciative behaviors, there is still a lack of understanding regarding the effectiveness of LNT. Very few of these previous studies specifically evaluated LNT, but instead focused upon minimum or low-impact behaviors. Many studies were atheoretical, and most evaluations focused on change in knowledge, without addressing a more systematic evaluation of LNT (Vagias, 2009). Studies that examine factors that limit compliance with recommended LNT practices have been nominal (David Cole, personal communication, 2/16/11; Cole et al., 1997; Harding, Borrie, & Cole, 2000; Marion & Reid, 2001; Miller, Borrie, & Harding, 2001), and most studies have only addressed backcountry wilderness visitors. Of particular concern, is the lack of research concerning day-users, which is currently the largest, and increasingly growing group of visitors (Chavez, 2000; Cole, Watson, & Roggenbuck, 1995; Hendee & Dawson, 2002; Outdoor Foundation Outdoor Participation Report, 2010; Papenfuse, Roggenbuck, & Hall, 2000; Reid, 2000; Roggenbuck & Lucas, 1987; Roggenbuck, Marion & Manning, 1994).

Leave No Trace principles and practices have become the most prominent method to encourage correct behavior and discourage depreciative behavior in these protected areas (Harmon, 1997; Marion & Reid, 2001; 2007; Vagias & Powell, 2010), but research focused on day-users has been largely neglected (Cole, 2001; Papenfuse et al., 2000; Roggenbuck et al., 1994). Studies that have addressed this user-group have either not focused specifically upon LNT, but instead upon minimum-impact practices and regulations for a specific area (Newman et al., 2003), or have evaluated only frontcountry

urban parks or open space visitors (Jones, 1999; Jones & Bruyere, 2004; Leung & Attarian, 2003; Mertz, 2002). The LNT Center and land managers must better understand day-user perceptions of LNT to effectively message and mitigate depreciative behaviors stemming from this growing user-group.

Understanding day-user perceptions of LNT requires determining visitors' level of knowledge and awareness of LNT, because if visitors do not understand or are not aware of recommended practices, they may unintentionally act unskillfully or inappropriately (Manning, 2003; 2007). In addition to these measures, social psychology has advanced understanding of human behavior and suggests attitudes also influence, and in many instances, are the primary determinant of behavioral intentions and actions (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Manfredo, 1992; Ham, 2007; Ham & Krumpe, 1996). Vagias and Powell (2010) applied attitude theory to examine backcountry-overnight visitors' perceptions and support of LNT and to determine attitudes toward backcountry behaviors that corresponded with LNT Principles at Cumberland Island National Seashore, Glacier and Olympic National Parks. The authors also examined visitors' knowledge, awareness, and global perceptions of LNT. Results indicated that general perceptions of the LNT message were positive, a finding that suggests backcountry-overnight visitors are largely supportive of LNT, and should be supportive of future educational strategies aimed at this user-group. However, backcountry-overnight visitor attitudes toward specific recommended LNT practices varied between suggested behaviors. This incongruity between general perceptions of LNT and specific attitudes of LNT practices suggests that positive 'global' attitudes regarding the program did not necessarily equate to positive attitudes toward specific

LNT practices. These results also suggest that certain LNT practices were either not fully understood by the backcountry-overnight visitors or that there was a level of indifference regarding the recommendations.

The Vagias and Powell (2010) study provided greater understanding of backcountry-overnight visitors, but research concerning day-users with regard to LNT is deficient. Determining day-user knowledge, awareness and global perceptions, and attitudes toward LNT will provide understanding that can be applied to increase efficacy and improve effective messaging strategies, which can alter behaviors and better preserve resource conditions and visitor experiences. Chapter two explores these deficiencies within a manuscript format, by contrasting day-user knowledge, awareness and global perceptions, and attitudes toward LNT with those of backcountry-overnight visitors.

Alternative Transportation Systems

The NPS strives to accommodate high levels of visitor use and accompanying vehicle traffic, while protecting and preserving resource and social conditions. High levels of vehicle traffic have attributed to crowding on roadways and parking areas, resource impacts to vegetation and wildlife, safety issues, and air and noise pollution, which in some units have created an environment that aligns more with an urban setting, rather than the natural environment, and associated experiences prescribed through the NPS mission. However, personal automobiles have historically influenced development of park infrastructure and are an integral part of visitor experiences in national parks. The nearly simultaneous mass production of Henry Ford's Model T and the promotional influence of the National Park Service's first director, Stephen Mather, spawned tourism and construction of park roads and facilities in units across the nation. Most park roads

were designed and constructed to allow visitors to experience panoramic vistas overlooking iconic park features, all by way of personal vehicle, and in many parks today, the quality of the visitor experience relies upon these components (Turnbull, 2003). However, high visitation and the associated impacts personal vehicles inflict upon resource and social conditions have created the need for alternative transportation systems (ATS) to help alleviate the reliance upon the personal automobile (Dunning, 2005; Pettebone et al., 2011; Turnbull, 2003; White, 2007; White, Aquino, Budruk, & Golub, 2011).

Many national parks have implemented shuttle systems to help alleviate the reliance upon personal automobiles and mitigate the resource and social impacts associated with this type of transportation mode. Increased focus on ATS across a substantial number of NPS units has led to a greater need for improving the understanding of visitor perspectives across sites, so similar infrastructure and educational messaging may be applied that would streamline ridership experiences and decrease reliance on personal vehicles. Historically however, personal vehicles have influenced NPS units through infrastructure and development, and for many visitors, are an integral component of their park experience. Given the historical relevance of personal vehicles, there is little understanding of how visitors perceive the shift to ATS in parks. Without understanding how ATS is perceived, management will not be able to effectively message to visitors, improve ridership, and alleviate resource and social impacts associated with personal vehicles in parks.

ATS-related Social Science Research

A visitor's choice to use ATS rather than a personal vehicle largely depends upon visitor attitudes toward transportation modes (Anable, 2005; Anable & Gatersleben, 2005; Bamberg, Ajzen, & Schmidt, 2003; Bamberg, Rolle, & Weber, 2003; Cullinane & Cullinane, 1999), because attitudes are the primary determinant of behavioral intentions and actions (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Manfredo, 1992). Yet few studies have evaluated visitor attitudes toward ATS in NPS units (Pettebone et al., 2011; White et al., 2011).

Studies addressing visitor attitudes toward ATS have generally suggested that visitors are supportive of free or voluntary ATS options, but are less receptive to fee-based or mandatory ATS in parks (Holly, Hallo, Baldwin, & Mainella, 2010; Sims, Hodges, Fly, & Stephens, 2005; White, 2007), perhaps because of the loss of perceived "freedom" (Dilworth, 2003; Miller & Wright, 1999; Sims et al., 2005). For example, Holly et al., 2010 found that maintaining individual freedom was the most important factor for Acadia National Park visitors when considering whether or not to ride the park shuttle bus. Attitudes toward ATS have also been found to largely depend upon visitor characteristics or demographic features such as age or family situation, suggesting that older visitors (Dilworth, 2003; Moscardo, Pearce, & Morrison, 2001; Pettebone et al., 2011; Prideaux, Wei, & Ruys, 2001) or visitors that are traveling with small children are less likely to use ATS (Middelkoop, Borgers, & Timmermans, 2003; White, 2007; Youngs, White, & Wodrich, 2008). Other studies have found that some visitors perceive an element of safety when participating in ATS, by enabling them to enjoy parks while eliminating the responsibility of operating a personal vehicle (Hallo & Manning, 2009).

These findings suggest that visitors have a perception of "ease" or lack thereof when choosing whether or not to participate in ATS. Other factors such as crowding on the roadways (Manning, Lawson, Valliere, Bacon, Laven, 2002; Park Studies Laboratory, 2002; Pettebone et al., 2011) or parking difficulties (Pettebone et al., 2011; White, 2007; Youngs et al., 2008) have been found to affect visitor attitudes toward ATS, suggesting that elements of "stress" may play a role in visitors' choice to use ATS.

These previous findings have improved understanding of visitor perceptions of ATS, which can be applied to the development of indicators and standards of quality for visitor use and transportation frameworks. For example, a recent study in Yosemite National Park evaluated visitors' perceptions of travelling via ATS and personal vehicle in order to identify visitor preferences that would inform park management of transportation-related indicators and standards (White et al., 2011). Results suggested that personal vehicles were the most popular mode of transportation within the park, but visitors were generally satisfied with either transportation experience, personal vehicle or park shuttle. However, perceptions of satisfaction are broad and subject to substantial personal interpretation, and given the 'self-selected' nature by which visitors choose recreation opportunities that meet expectations and outcomes, high levels of satisfaction are commonly reported (Manning, 2007, p. 15), which limits the usefulness of these findings. More informative were the results from the attitude dimensions which found that stress, crowding, conflict, freedom, access, and natural experiences were important aspects of the overall transportation experience in Yosemite; this was consistent with previous findings (White, 2007; Youngs et al., 2008) and other transportation-related research in other NPS units (Davenport & Borrie, 2005; Hallo & Manning, 2009; Sims et

al., 2005). Three scales were ultimately created from these dimensions (1. stress and conflict, 2. freedom and access, and 3. nature experience), and the authors recommended that the park transportation-related indicators and standards be based on these elements (White et al., 2011). This study advanced understanding of visitor preferences for transportation modes, and informed managers of potential indicators and standards that could be monitored to achieve desired conditions. However, this study offered little understanding of how these findings could be applied to improve visitor participation in ATS.

Chapter three of this dissertation builds upon the findings of the White et al., 2011 study, by contrasting visitor attitudes toward ATS at Yosemite and Rocky Mountain National Parks, in an effort to determine salient attitudinal variables that are perceived similarly across these units. Determining salient variables advances understanding of potential ATS-related indicators and standards of quality, which increases protection of resource and social conditions, and allows for the development of educational messaging strategies that can be applied to alleviate reliance on personal automobiles and encourage ATS use.

Soundscape Management

Mandates such as the 1972 Noise Control Act, the 1987 National Parks Overflights Act, and recent National Park Service (NPS) policy directives require the protection of the acoustic environment as a resource, similar to that of the flora and fauna present in our national parks, and specifies that parks should integrate monitoring and planning efforts to protect park soundscapes (Newman, Manning, & Trevino, 2010). Accordingly, the NPS Natural Sounds and Night Skies Division, which is dedicated to

the protection of the acoustic environment or soundscape, strives to improve resource and social monitoring and planning efforts within the park units.

Ambrose and Burson (2004) refer to a 'soundscape' as "the total ambient acoustical environment associated with a given area," which "may be natural sounds only, or both natural and human-made sounds" (p. 29). These sounds can be measured through frequency and amplitude, and are 'weighted' to reflect the hearing abilities of a given species (Ambrose & Burson, 2004). 'Frequency' (Hz) reflects the amount of times a sound wave repeats itself per second, and 'amplitude' is the level of sound pressure, which is measured in decibels (dB) (Ambrose & Burson, 2004; NPS Natural Sounds and Night Skies Division Interpretive Handbook, 2010). A-weighted decibel (dBA) scales are commonly used with human subjects. These units are determined by merging sound energy using a weighted function, which adjusts sound pressure levels to allow for human hearing (Ambrose & Burson, 2004; Fahy, 2001; Fristrup, 2010; Stack, Newman, Manning, & Fristrup, 2011). 'Sounds' depict neither a positive or negative connotation; however, 'noise' refers to a negative evaluation of a sound. Human-caused, or anthropogenic noise, such as the sounds produced by loud voices, vehicles, and airplanes, have been linked with negative resource and social impacts (Barber, et al., 2010; Barber, Turina, & Fristrup, 2010; Bell, Mace, & Benfield, 2010; Benfield, Bell, Troup, & Soderstrom, 2009; Krog & Engdahl, 2005; Mace, Bell, Loomis, & Haas, 2003; Miller, 1999; Miller, Anderson, Horonjeff, & Thompon, 1999; Pilcher, Newman, & Manning, 2008; Tarrant, Haas, & Manfredo, 1995).

The majority of Americans consider opportunities to experience the sounds of nature as an important reason for protecting national parks (Haas & Wakefield, 1998),

and research suggests that visitors often retreat to parks to experience the sounds of nature, such as wind, water, and natural quiet (Driver, Tinsley, & Manfredo, 1991; Haas & Wakefield, 1998; Mace et al., 2003; McDonald, Baumgartner, & Iachan, 1995). Yet anthropogenic noise can mask natural sounds, impacting wildlife foraging, mating, and migrating patterns, increasing predation risks (Barber et al., 2010; Barber et al., 2010), and negatively affecting visitor experiences (Bell et al., 2010; Benfield et al., 2009; Krog & Engdahl, 2005; Mace et al., 2004; Miller, 1999; Miller et al., 1999; Pilcher et al., 2008; Tarrant et al., 1995). Policies requiring the NPS to preserve the natural soundscape as a resource demand that managers determine how much change should be allowed to affect the environment and recreational experiences. Maintaining quality recreational experiences requires that managers develop social indicators and standards of quality pertaining to soundscapes.

Recent research has helped inform the NPS concerning effective sound-related indicators and standards of quality that help managers protect, maintain, and restore the natural acoustic environment. Pilcher, Newman, and Manning (2008) conducted a two-phase study in Muir Woods National Monument where sound-related social indicators and standards of quality were established. Phase-one focused upon descriptive evaluations, by asking respondents to listen to the surrounding environment, and then, to determine the degree to which sounds heard were pleasing or annoying. Results suggested that visitor-caused sounds, such as groups talking, were frequently heard and rated as annoying, and would therefore serve as a good indicator of quality. Phase-two focused upon the evaluative component by specifically addressing varying levels of visitor-talking sounds to determine respondents' threshold, and subsequently established

a standard of quality. A series of soundclips were created from the recordings of the area, each containing varying levels of visitor-talking sounds. Respondent evaluations of these soundclips determined that sound pressure stemming from visitors' talking at a level of 38 decibels or greater, was unacceptable. Correlating this established standard with acoustic monitoring data, the researchers suggested that visitor standards were being violated within the study area at least a portion of the time, potentially degrading the quality of the visitor experience.

A subsequent experimental study implemented educational messaging through signs denoting either a 'quiet zone' or a 'quiet day' (Manning, Newman, Fristrup, Stack, Pilcher, 2010; Stack, 2008; Stack et al., 2011), which was found to effectively lower the amount of human-caused noise within the area. Implementation of 'quite zone' messaging decreased visitor noise by 3 (dBA), essentially doubling a visitor's listening area (Stack et al., 2011). The results of this study demonstrate the positive influence that indirect management, such as educational messaging, can have on visitor behaviors and preservation of park soundscapes. However, there has been limited research evaluating the role of messaging in modifying visitor perceptions and evaluations of anthropogenic noise.

Exposure to noise produced by aircraft overflights has been found to negatively detract from visitor experiences (Krog & Engdahl, 2005; Mace et al., 1999; 2004; Mace et al., 2003; Miller, 1999; Miller et al., 1999; Tarrant et al., 1995), and experimental messaging pertaining to aircraft sound evaluations has been limited. Mace, Bell, Loomis, and Haas (2003) began to investigate this deficiency by examining how contextual messaging may change evaluations of helicopter noise within park settings. In a

laboratory, participants were asked to evaluate helicopter sounds after being notified that the noise could be attributed to "tourist overflights," "backcountry maintenance operations," and the "rescue of a backcountry hiker." The researchers determined that regardless which reason was attributed to the sound, amplified helicopter noise resulted in lower evaluations of the park setting and greater levels of annoyance. These findings suggested that park management-related noise disturbances are just as annoying as other aircraft noise sources. This study advanced understanding of how messaging may or may not influence perceptions and evaluations of sounds in parks; however, this research was conducted solely within a laboratory setting, used relatively simplistic messaging approaches, and used only the noise of helicopters, which generally fly lower generating more disturbing sounds (Bell et al., 2010). Miller, Anderson, Horonjeff and Thompon (1999) evaluated whether informing visitors that they may hear or see aircraft would reduce adverse effects of military aircraft sounds at White Sands National Monument. Results suggested that by providing information, respondent annoyance of military aircraft sounds was decreased by approximately 10% (Miller et al., 1999), suggesting that educational messaging could affect perceptions and evaluations of aircraft within this setting.

The results of these studies suggest that educational messaging can be applied as an effective management strategy to decrease anthropogenic noise, and potentially alter perceptions of anthropogenic noise depending upon the context and environment in which sounds are heard. Chapter four of this dissertation builds upon this research within a manuscript format, by designing an informative message based upon theoretical frameworks, to determine if messaging can alter Sequoia National Park visitor attitudes,

perceptions, expectations, and therefore standards of quality in regard to military aircraft sounds.

CHAPTER II

Comparing Day-users' and Overnight Visitors' Attitudes Concerning Leave No Trace

Introduction

The National Park Service (NPS) maintains a delicate balance between use and preservation (NPS Organic Act) amidst annual visitation approaching nearly three hundred million (NPS Statistics, 2010). The vast majority of recreationists are day-users (Outdoor Foundation Outdoor Participation Report, 2010), and previous research suggests that day-use is increasing in protected areas (Chavez, 2000; Cole et al., 1995; Hendee & Dawson, 2002; Papenfuse et al., 2000; Roggenbuck & Lucas, 1987; Roggenbuck et al., 1994). For example, of the nearly three hundred million NPS visitors in 2010, there were only 1,763,541 backcountry overnight visits (NPS Statistics, 2010). Given significant visitation, impacts to both the resource condition and visitor experience, continue to be a primary concern for park managers (Marion & Reid, 2007). Education is one technique used to mitigate visitor impacts (Hammit & Cole, 1998; Hendee & Dawson, 2002; Lucas, 1983; Manning, 2003; 2007; Marion & Reid, 2001; 2007), and the Leave No Trace (LNT) message has become the most prominent method to encourage correct behavior and discourage depreciative behavior in protected areas (Harmon, 1997; Marion & Reid, 2001; 2007; Vagias & Powell, 2010). Leave No Trace was initially developed to curb impacts of backcountry overnight visitors (Marion & Reid, 2001), and correspondingly, most LNT-related research has focused on this user-group (Marion & Reid, 2001; 2007). Despite the growing number of day-users, research focused on this user-group has largely been neglected (Cole, 2001; Papenfuse et al.,

2000; Roggenbuck et al., 1994). Previous research suggests that day-use should be managed similarly to overnight use (Cole, 2001; Papenfuse et al., 2000), but very little, if any, is known about day-users with regard to LNT. The purpose of this study was to gain greater understanding of visitor knowledge and attitudes toward LNT by comparing and contrasting day-users and overnight users, in an effort to improve efficacy and inform management of effective methods that could curb depreciative behaviors among both user-groups.

Leave No Trace

Leave No Trace was derived from minimum-impact educational initiatives employed to supplement direct management measures, in an effort to mitigate overuse of wildlands in the 1960s (Marion & Reid, 2001). Since that time, LNT has continued to grow from an educational program into a registered non-profit organization now known as the Leave No Trace Center for Outdoor Ethics, and has been adopted both nationally by the federal land agencies as well as many state and urban parks, and internationally (Marion & Reid, 2001). The LNT Center promotes stewardship-based ethics through various educational initiatives focused on many types of recreationists (i.e., backcountry-overnight, frontcountry, youth), but all efforts stem from the following 7 LNT Principles:

1. Plan ahead and prepare
2. Travel and camp on durable surfaces
3. Dispose of waste properly
4. Leave what you find
5. Minimize campfire impacts
6. Respect wildlife
7. Be considerate of other visitors

Theoretical Basis

Previous Research, Knowledge, Awareness, and Attitudes

The majority of minimum-impact related research has focused upon backcountry wilderness campers or overnight visitors (Christensen & Cole, 2000; Daniels & Marion, 2005; Fazio, 1979; Huffman & Williams, 1987; Lucas, 1981; Roggenbuck & Berrier, 1982; Stubbs, 1991; Thorn, 1995; Vagias, 2009; Vagias & Powell, 2010), and many studies have addressed education and visitor knowledge of recommended practices (Cole et al., 1997; Confer et al., 2000; Daniels & Marion, 2005; Dowell & McCool, 1986; Fazio, 1979; Jones, 1999; Jones & Bruyere, 2004; Leung & Attarian, 2003; McAvoy & Hamborg, 1984; McCool & Cole, 2000; Newman et al., 2003; Reuhrwein, 1998; Stewart, et al., 2000; Stubbs, 1991; Thorn, 1995). Knowledge and awareness are important components for mitigating depreciative behaviors because, if visitors lack knowledge or awareness, they may unintentionally act unskillfully or inappropriately (Manning, 2003; 2007). In addition to these measures, social psychology has advanced understanding of human behavior and suggests attitudes also influence, and in many instances, are the primary determinant of behavioral intentions and actions (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Manfredo, 1992; Ham, 2007; Ham & Krumpe, 1996).

Vagias and Powell (2010) applied attitude theory to examine backcountry-overnight visitors' perceptions and support of LNT and their attitudes toward backcountry behaviors that corresponded with LNT Principles at three NPS units. Results indicated that general perceptions of the LNT message were positive, a finding that suggests backcountry-overnight visitors are largely supportive of LNT; however, attitudes toward specific recommended LNT practices varied between suggested

behaviors. This incongruity between general perceptions of LNT and attitudes of specific LNT practices suggest that positive 'global' attitudes regarding the program did not necessarily equate to positive attitudes toward specific LNT practices. These results also suggest that certain LNT practices were either not fully understood by the backcountry-overnight visitors or that there was a level of indifference regarding the recommendations.

The Vagias and Powell (2010) study provided greater understanding of backcountry-overnight visitors with regard to LNT by applying attitude theory to explore support, knowledge, and attitudes toward LNT. However, research concerning the majority of recreationists—day-users—has largely been neglected (Cole, 2001; Papenfuse et al., 2000; Roggenbuck et al., 1994). Newman et al. (2003) began to address this deficiency by examining Appalachian Trail (AT) visitors' knowledge concerning minimum-impact practices through a 10-item quiz. Findings suggested that only a few statistically-significant differences existed between day-hikers, overnight, sectional, and thru-hikers concerning minimum-impact practices. Overall results indicated that day-hikers had similar understanding of minimum-impact practices as the other user-groups. This study helped advance understanding of visitor user-groups and their knowledge of minimum-impact practices, but did not specifically address LNT or other aspects of visitor perceptions, such as awareness or attitudes.

The LNT Center for Outdoor Ethics and land managers must understand day-user perceptions of LNT to effectively mitigate depreciative behaviors. Determining day-user knowledge, awareness and global perceptions, and attitudes toward LNT will provide understanding that can be applied to increase efficacy and to improve effective messaging

strategies, which can alter behaviors and better preserve resource conditions and visitor experiences. No studies have specifically evaluated day-use visitor perceptions of LNT. Therefore, the purpose of this study was to develop a better understanding of day-user knowledge, awareness and global perceptions, and attitudes toward LNT, by contrasting their characteristics with those of overnight users. This study evaluated these perceptions by comparing day-users at Rocky Mountain National Park and backcountry-overnight visitors at Olympic National Park. Contrasting knowledge, awareness, and attitudes of these visitor-groups will allow the LNT Center, and land managers, to better understand the discrepancies that may impede adoption of the ethic of practicing LNT, and therefore, may assist with the development of more effectual educational approaches.

Methods

Study Areas

Backcountry-overnight visitors were sampled at Olympic National Park (ONP), Washington, during the summer of 2007**.** The park contains nearly one million acres of designated wilderness consisting of rugged coastline, temperate rainforest, and alpine peaks (Vagias, 2009). Day-user visitors were sampled at Rocky Mountain National Park (RMNP), Colorado, during the summer of 2009. The park is within close proximity to the Colorado front-range community of Denver, Colorado, allowing for easy access to day-visitors wishing to experience the park's forests, alpine meadows, lakes and tundra.

Survey Administration

Backcountry-overnight visitors at ONP were intercepted during their permitting processes and asked to provide contact information. Approximately one month after

contact, respondents were sent self-administered mail-back surveys which yielded an overall response rate of 73% with a total $n = 312$.

Day-users at RMNP were intercepted in the Bear Lake corridor at the Glacier Gorge and Bear Lake Trailheads. The corridor is predominantly frequented by day-users, and can reach more than 8,000 visitors daily during peak season (Park, Lawson, Kaliski, Newman, & Gibson, 2010). Respondents were asked to complete an on-site written survey (Appendix A) yielding an overall response rate of 74% with a total $n = 390$.

Item Measurement

Respondents in both samples were asked to describe their "current knowledge of LNT practices" based on a 7-point scale (0 = 'No Knowledge' – 6 = 'Expert') to determine their overall level of self-perceived knowledge about LNT. Respondents were also asked to indicate their level of agreement with a series of statements about LNT, which evaluated visitors' awareness and global perceptions of the LNT program based on a 7-point scale (1 = 'Strongly Disagree' - 7 = 'Strongly Agree'). All statements were coded to have higher means if the respondents supported LNT, except for the final statement, which portrayed LNT as ineffectual in reducing environmental harm. Lower mean scores for this particular statement would have demonstrated support for LNT.

Statements developed from LNT Principles #2, "Travel on Durable Surfaces," #4, "Leave What You Find," #6, "Respect Wildlife," and #7, "Be Considerate of Other Visitors," were used to evaluate the appropriateness of LNT practices because these Principles are pertinent to both backcountry and day-user endeavors. The statements were evaluated on a 7-point scale (1 = 'Very Inappropriate' – 7 = 'Very Appropriate'). All statements represented inappropriate behaviors under strict interpretation of LNT.

Therefore, responses with lower mean scores indicated that respondent attitudes were more congruent with LNT practices.

Data Analyses

Independent samples t-tests were used to determine if day-users and backcountry-overnight visitors differed statistically. Sun, Pan and Wang (2010) suggest, "a test result that is statistically significant as judged by the *p*-value is not necessarily practically significant as judged by the effect size" (Sun, Pan, & Wang, p. 991). Survey research with relatively large sample sizes may result in statistically significant results, but actually have little practical value (Vaske, 2008). Effect size measures provide additional understanding of differences by offering "a standardized estimate of the magnitude of variable relationships" (Vaske, p. 117, 2008). Evaluation of effect size measures allows for greater intuitive meaning of practical differences between samples. Effect sizes between these samples were determined by evaluating Eta values (η) categorized as having either a "minimal", ($\eta = \sim.10$), a "typical", ($\eta = \sim.30$), or a "substantial" effect measures ($\eta = \sim.50$) (Cohen, 1988; Vaske, 2008; Vaske, Gliner, & Morgan, 2002). Consideration of statistical significance and practical significance was examined through *p*-values, Eta values, and the importance of the mean differences between samples.

Results

Visitor Characteristics

Demographic results were similar between backcountry-overnight visitors at ONP and the day-users at RMNP with regard to gender, mean age, race, and education. At ONP, there were slightly more male respondents (60%), while at RMNP approximately 53% of the respondents were female. ONP respondents were slightly younger with a

mean age of approximately 42 while RMNP respondents were on average 48 years old. Across both samples, 95% or more of the respondents were Caucasian, and over 90% had attended college.

Perceived Knowledge of LNT

Results concerning the level of perceived knowledge of LNT practices indicated that the majority of the backcountry-overnight visitors and day-users consider themselves as having 'Average' to 'Expert' knowledge of LNT. Mean values resulted in statistical differences between the samples, (ONP $M = 3.97$, RMNP $M = 3.45$, $p < .001$, $\eta = .177$), although the effect size suggests a minimal difference (Table 2.1). Mean differences of 0.52 based on the 7-point scale also suggest that there are little practical differences between backcountry-overnight and day-use visitors with regard to self-perceived knowledge of LNT.

Table 2.1
Self-Perceived Knowledge of LNT Practices – ONP (Backcountry-overnight visitors) and RMNP (Day-users)

Unit	*n*	Mean	SD	*t*-value	*p*-value	Eta (η)
ONP	303	3.97	0.94	5.03	<.001	.177
RMNP	384	3.45	1.74			

Note. Variables coded on a 7-point scale (0 = No Knowledge – 6 = Expert)

Awareness and Global Perceptions of LNT

Evaluation of the statements addressing global support of LNT resulted in similar mean values across both backcountry-overnight visitors and day-users (Table 2.2). Results indicate that both groups were largely supportive of LNT, with minimal differences between backcountry-overnight visitors and day-users. Mean values for four out of the five statements that suggested support of LNT were all greater than 5.84,

indicating that both backcountry-overnight visitors and day-users perceived LNT positively on a global level. The fifth statement, which was reverse-coded and portrayed LNT as ineffectual in reducing environmental harm, yielded statistically-significant differences, (ONP $M = 1.56$, RMNP $M = 1.92$, $p = .001$, $\eta = .122$), but the effect size indicated a minimal difference. Mean differences of 0.36 suggest little practical differences in perceptions of LNT between the samples.

Table 2.2
Comparison of ONP (Backcountry-overnight visitors) and RMNP (Day-users) Awareness and Global Support of LNT

Attitude Statements	Unit	*n*	Mean	SD	*t*-value	*p*-value	Eta (η)
It is important to use minimum- impact/LNT techniques when in the backcountry.	ONP	302	6.46	1.2	0.51	.607	.020
It is important to practice "Leave No Trace" techniques when in the Park.	RMNP	384	6.51	1.1			
If I learned my actions in the backcountry damaged the environment, I would change my behavior.	ONP	302	6.46	0.9	0.41	.686	.015
If I learned my actions in the Park damaged the environment, I would change my behavior.	RMNP	384	6.50	1.1			
I get upset when I see other individuals in the backcountry not following minimum-impact/LNT practices.	ONP	303	6.14	1.1	1.87	.064	.071
I get upset when I see other individuals in the Park not following "Leave No Trace" practices.	RMNP	386	6.30	1.2			
I insist that minimum-impact/LNT practices are followed by all members of my backcountry party.	ONP	306	5.84	1.2	1.46	.143	.055
I insist that "Leave No Trace" practices are followed by all members of my group.	RMNP	386	6.0	1.3			
Minimum-impact/LNT techniques do not reduce the environmental harm caused by backcountry travel.	ONP	302	1.56[1]	1.6	3.35	.001	.122
Practicing "Leave No Trace" does not reduce the environmental harm caused by travel in the Park.	RMNP	384	1.92[1]	1.7			

Note. Variables coded on a 7-point scale (1 = Strongly Disagree – 7 Strongly Agree)
[1] Lower mean values reflect attitudes that support Leave No Trace because statements portray Leave No Trace as ineffectual in reducing environmental harm

Attitudes Regarding LNT Principles

Analyses of differences between attitudes of backcountry-overnight visitors and day-users varied depending upon the Principle (Table 2.3). Evaluation of Principle #2, "Travel on Durable Surfaces," indicated that responses based on the appropriateness of

walking around muddy spots on the trail were statistically significant between backcountry-overnight visitors and day-users, (ONP $M = 4.02$, RMNP $M = 4.48$, $p = .001$, $\eta = .125$), but effect sizes reflected a minimal difference. Mean differences of only 0.46 also suggest minimal difference between the samples. The variable *hike side by side on an existing trail* resulted in similar lower mean values (ONP $M = 2.93$, RMNP $M = 3.37$, $p = .001$, $\eta = .128$), and despite statistically-significant differences, the practical significance was minimal based upon the effect size. Mean differences of only 0.44 also support this finding. Twenty-nine percent of the backcountry-overnight visitors and eleven percent of the day-user respondents considered *keeping a small item as a souvenir*, which is associated with Principle #4, "Leave What You Find," to be an appropriate behavior. Statistically-significant differences resulted among the samples, (ONP $M = 3.52$, RMNP $M = 2.25$, $p < .001$, $\eta = .353$). The typical effect size and mean difference of 1.3 reinforce this significant finding. Examination of Principle #6, "Respect Wildlife," suggests that only 0.6% of the backcountry-overnight visitors and only 4.4% day-users *found dropping food on the ground to provide wildlife a food source* to be an appropriate behavior. Statistical differences were significant among the samples, (ONP $M = 1.19$, RMNP $M = 1.43$, $p = .001$, $\eta = .117$), although the minimal effect size and mean difference of 0.24 suggest little practical difference between the user-groups. Attitudes regarding LNT Principle #7, "Be Considerate of Other Visitors" by *taking a break along the edge of a trail* resulted in the majority of both samples reflecting attitudes that did not align with the LNT-recommended behavior. Approximately 78% of the backcountry-overnight respondents and 74% of the day-users indicated that this behavior was

appropriate, yielding insignificant statistical differences among the groups, (ONP M = 5.69, RMNP M = 5.48, p = 0.57).

Table 2.3
Comparison of ONP (Backcountry-overnight visitors) and RMNP (Day-users) Attitudes Regarding LNT Practices

Attitude Statements	Unit	*n*	Mean	SD	*t*-value	*p*-value	Eta (η)
LNT Principle #2: Travel and Camp on Durable Surfaces							
Walking around muddy spots on the trail	ONP	308	4.02	1.6	3.39	.001	.125
Walk around muddy spots on the trail	RMNP	385	4.48	2.0			
Hiking side by side with my friends on existing backcountry trails	ONP	308	2.93	1.6	3.44	.001	.128
Hike side by side with members of my group on existing trails	RMNP	387	3.37	1.8			
LNT Principle #4: Leave What You Find							
Keeping a single small item like a rock or feather as a souvenir	ONP	309	3.52	1.7	9.87	<.001	.353
Keep a single item like a rock, plant, stick or feather as a souvenir	RMNP	388	2.25	1.6			
LNT Principle #6: Respect Wildlife							
Dropping food on the ground to provide wildlife a food source	ONP	310	1.19	0.7	3.30	.001	.117
Drop food on the ground to provide wildlife a food source	RMNP	388	1.43	1.2			
LNT Principle #7: Be Considerate of Other Visitors							
Taking a break along the edge of a trail	ONP	304	5.69	1.4	1.90	.057	.071
Take a break along the edge of the trail	RMNP	387	5.48	1.6			

Note. All attitude statements reflect inappropriate actions based on Leave No Trace Principles
Variables coded on a 7-point scale (1 = Very Inappropriate – 7 Very Appropriate)

Discussion

LNT is a prominent educational method employed to alter visitor behaviors and mitigate resource and social impacts in parks and protected areas. Day-users are the largest group of recreationists, yet very little is known about this user-group with regard

to LNT. The goal of this study was to develop a better understanding of day-user knowledge, awareness and global perceptions, and attitudes toward LNT, by comparing their characteristics with those of overnight users. Understanding how day-users perceive LNT is essential to management so that effective messaging can be designed for this growing user-group. Overall findings suggest that the sampled backcountry-overnight visitors and day-users were rather similar with regard to perceived knowledge, awareness and global perceptions of LNT, and most of the examined attitudes regarding LNT Principles.

Examination of perceived knowledge of LNT resulted in a minimal effect size and a mean difference of only 0.5 on the 7-point scale, suggesting little practical difference between the two user-groups. The majority of respondents described their understanding of LNT practices to be 'Average' to 'Expert', indicating that both samples were fairly certain in their knowledge of LNT. However, self-perceived knowledge did not necessarily equate to appropriate behavioral understanding of specific LNT principles. For instance, practices related to Principle #2, "Travel and Camp on Durable Surfaces" and Principle #7, "Be Considerate of Other Visitors" were largely misunderstood across both samples, despite high levels of perceived knowledge.

Findings indicate that both backcountry-overnight visitors and day-users were highly supportive of LNT. Both user-groups strongly agreed with global attitude statements that positively portrayed LNT, and strongly disagreed with the statement that depicted LNT as ineffective. These findings are valuable for the LNT Center and protected areas managers as they strive to influence visitor behaviors, suggesting that

both overnight and day-use visitors will be supportive of future LNT-related educational strategies.

Attitudes regarding specific LNT principles were congruent across both samples for Principles #2, "Travel and Camp on Durable Surfaces," #6, "Respect Wildlife," and #7, "Be Considerate of Other Visitors." Concepts concerning "Respecting Wildlife" resulted in attitudes that align with LNT-recommended practices and were largely understood by both user-groups. This suggests that backcountry-overnight and day-users are cognizant of the proper ethics regarding their behavior around wildlife. Behaviors embodied under "Traveling and Camping on Durable Surfaces" and "Being Considerate of Other Visitors" were, to a great extent, misinterpreted by backcountry-overnight and day-users, and deserve additional educational focus. Previous LNT-related research suggests educational messages should be clear, concise, and occur early in the visitor's planning process (Cole et al., 1997; Douchette & Cole, 1993; Lime & Lucas, 1977; Roggenbuck & Berrier, 1982; Stewart et al., 2000), be reinforced and timely near potential problematic areas (Hockett, 2000; Hockett & Hall, 2007; Widman, 2010; Widner & Roggenbuck, 2000), and not provide so much information that the receiver is overloaded (Cole et al., 1997). Furthermore, educational messages should be based on theoretical frameworks (Manning, 2003; Marion & Reid, 2007), target salient beliefs and attitudes by making them content relevant (Ham & Krumpe, 1996), and should strive to be contextually specific (Vagias, 2009; Vagias & Powell, 2010). The results from this study suggest that future educational strategies should target backcountry and day-use visitors' behaviors related to "Traveling and Camping on Durable Surfaces" and "Being Considerate of Other Visitors" similarly, while considering and implementing messaging

that encompasses the previous literature findings. For example, if a park is experiencing trail-widening in low-lying locations, in addition to presenting Principle # 2, "Traveling and Camping on Durable Surfaces," management may include a message near the problematic areas stating, "Walking around puddles widens trails and damages vegetation."

Attitudes towards Principle #4, "Leave What You Find," resulted in substantial differences between the user-groups. More backcountry-overnight than day-user respondents found "Keeping a single item as a souvenir," to be appropriate, based on statistically-significant mean differences of 1.3. This suggests that backcountry-overnight visitors and day-users may require different educational strategies for this particular practice. These results are important for the LNT organization, because these results may indicate an overall lack of understanding concerning the concepts related to this Principle, but perhaps more so with backcountry-overnight visitors. The LNT Center and protected areas managers should consider employing more focus to backpackers regarding Principle #4. For instance, the LNT Center could work with protected areas to implement additional messages that complement "Leave What You Find", at the pre-trip planning level through permitting websites, permitting offices, and backcountry trailhead locations.

Study Limitations and Future Research

There were several limitations to this study that merit additional research to support and further validate findings. The ONP respondents completed self-administered mail-back surveys, while the RMNP respondents completed onsite surveys administered by researchers; each of these instruments had slightly different variable phrasing to make

the behaviors or scenarios applicable to either overnight or day-use recreationists. If feasible, future studies should apply the same survey design and wording across samples. This study only evaluated perceived knowledge and awareness of LNT, and attitudes regarding Principles #2, #4, #6, and #7 because these Principles reflected behaviors that are similar and pertinent to both overnight and day-use endeavors. Subsequent studies should attempt to include the remaining three LNT Principles, #1, "Plan Ahead and Prepare," #3, "Dispose of Waste Properly," and #5, "Minimize Fire Impacts."

While results indicated similarities between backcountry-overnight visitors and day-users with regard to LNT, this study only applied to respondents at ONP and RMNP. The similar sample demographics support our speculative reasoning that these user-groups are alike, perhaps because they may be drawn from homogeneous populations, as other studies have suggested (Cole, 2001). For example, a day-user in RMNP may be a backpacker in ONP during another occasion. Future research may consider including variables that examine visitors' previous outdoor experience and motivation to better understand this issue. While this study addressed two separate national parks, research pertaining to overnight and day-use visitors within the same protected area should also be studied. Furthermore, comparisons across several types of protected areas and demographically diverse locations (e.g., city parks, state parks, wildlife refuges, etc.) should be studied to evaluate the generalizability of future educational efforts.

Conclusion

This study provides insight and improves understanding of day-user knowledge and salient attitudes toward LNT and LNT Principles. Findings suggest that backcountry-overnight visitors and day-users are rather similar with regard to perceived

knowledge, awareness and global perceptions of LNT, and attitudes regarding LNT Principles #2, #6, and #7. LNT is believed to be important and highly effective in minimizing resource impacts and curbing depreciative behaviors across both user-groups, suggesting that future educational strategies will be well received. Principles #2 and #7 require additional educational focus, and Principle #4 may require different messaging approaches for backcountry visitors, but this study suggests that backcountry-overnight and day-users can largely be educated about LNT in similar ways. Additional research is needed to determine the salience of these findings across different demographics and protected area types.

CHAPTER III

Attitudes toward Alternative Transportation Systems in Yosemite and Rocky Mountain National Parks

Introduction

Personal automobiles have historically influenced development of park infrastructure and are an integral part of visitor experiences in national parks. High visitation and use of personal vehicles have contributed to resource and social impacts such as crowding on roadways and parking areas, resource impacts to vegetation and wildlife, safety issues, and air and noise pollution. In some units, these impacts have created an environment that aligns more with an urban setting, rather than the natural environment and associated experiences prescribed through the NPS mission.

These impacts have prompted park managers to consider implementation of alternative transportation systems (ATS), such as park shuttles, to effectively transport visitors. Parks such as Zion, Acadia, Sequoia and Kings Canyon, Grand Canyon, Mount Rainier, Yosemite and Rocky Mountain National Park have implemented shuttle systems to help alleviate reliance upon personal automobiles and associated resource and social impacts in some of the most highly-visited areas of these parks. There are currently 63 ATS in 50 national park units (Daigle, 2008), and much time, effort, and money has been expended to improve upon these systems. A comprehensive study between the Federal Transit Administration and the Federal Highway Administration determined that the majority of NPS sites within the study were in need of enhanced services and new transit systems (Krechmer, Grimm, Hodge, Mendes, & Goetzke, 2001; Turnbull, 2003), suggesting that more emphasis will be placed on ATS in the near future.

Increased focus on ATS across a substantial number of NPS units has led to a greater need for improving understanding of visitor perspectives across sites, so similar infrastructure and educational messaging may be applied that would streamline ridership experiences and decrease reliance on personal vehicles. Given the historical relationship between personal automobiles and US national parks, relatively little is known concerning how the shift to ATS affects visitor experiences, or what barriers may prevent visitors from participating in ATS. Attitudes largely determine behavioral intentions and actions (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Manfredo, 1992). However, few studies have evaluated visitor attitudes toward ATS in NPS units (Pettebone et al., 2011; White et al., 2011), and no studies have compared visitor perspectives across units to determine and better understand salient attitudes.

The purpose of this study was to: 1) compare and contrast visitor attitudes regarding ATS at Yosemite National Park (YOSE) and Rocky Mountain National Park (RMNP); 2) determine salient attitudinal variables that are perceived similarly in an effort to better understand incentives and barriers to ATS participation; 3) advance understanding of potential messaging strategies that would encourage ridership; 4) inform managers of potential indicators and standards of quality related to ATS; and 5) suggest potential management strategies associated with these indicator variables. Understanding visitor attitudes toward ATS is important in order to develop transportation management policies that relieve visitor dependence on personal vehicles while mitigating potential impacts to visitor experiences. This understanding may be applied to interpretive messaging that influence visitor attitudes toward ATS, assist with development of ATS-

related indicators and standards of quality, and inform park infrastructure and development.

National Parks' History with Personal Automobiles

The automobile historically helped define infrastructure, and largely determined the way visitors experienced many US national parks. The nearly simultaneous mass production of Henry Ford's Model T and the promotional influence of the National Park Service's first director, Stephen Mather, spawned tourism and construction of park roads and facilities in units across the nation. By 1924, Henry Ford had released approximately 10,000,000 Model T's, yet there were only 12 miles of paved roads in all of the national park units (Everhart, 1983). However, Mather soon convinced Congress to allocate funding for additional roads and infrastructure, and the era of "See America First" led to increased motor visitation to the national parks.

Much of the early infrastructure within RMNP and YOSE was developed to meet this proclamation. In RMNP, Enos Mills proclaimed that roads should be "built so as to command scenery and to be for the most part mountain-sides and summits" and "touch the greatest and most beautiful spots" (Mills, p. 272, 1915). Also during this time, YOSE park planners tediously worked to insure that human-structures were hidden from view of the roadway to maintain the natural aesthetic view-scape (Colten & Dilsaver, 2005). Most park roads were designed and constructed to allow visitors to experience panoramic vistas overlooking iconic park features all by way of personal vehicle, and today, many of the focal points of visits remain the park roads (Turnbull, 2003). By the 1920s Fall River Road had been completed in RMNP allowing over 270,000 motorists to enter the park ("National Park Tourists," 1921); in YOSE, motorists had over 130 miles of roads

(mostly unpaved) to explore ("Motor Highways Poor in the National Parks," 1923), and private automobiles had become the primary mode of visiting the park (White et al., 2011). By 1925, it was estimated that 75% of the visitors to all national parks entered by automobile (Du Puy, 1925). "Automobile tourism provided a more intimate, personal, and authentic encounter with the 'real' America along a network of good roads that offered access to a shared national history and culture" (Shaffer, p. 168, 2001). This era helped shape the national park visitor experience still present in numerous national parks today. However, high visitation, leading to crowding, traffic congestion, parking shortages, added air and noise pollution, as well as impacts to park resources, has created the need for ATS in national parks to help alleviate the reliance upon the personal automobile (Dunning, 2005; Pettebone et al., 2011; Turnbull, 2003; White, 2007; White et al., 2011).

Theoretical Basis

Visitor Attitudes toward ATS

There has been an increased emphasis upon implementing ATS in parks, but given the historical relationship between personal vehicles and national parks, relatively little is known concerning how visitors perceive the shift to ATS or what barriers may impede ridership. The decision to use ATS in lieu of personal autos appears to be driven primarily by visitor attitudes toward transportation modes (Anable, 2005; Anable & Gatersleben, 2005; Bamberg et al., 2003a; Bamberg et al., 2003b; Cullinane & Cullinane, 1999), because attitudes are the principle determinant of behavioral intentions and actions (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Manfredo, 1992). Yet few studies

have evaluated visitor attitudes toward ATS in NPS units (Pettebone et al., 2011; White et al., 2011).

Studies addressing visitor attitudes toward ATS have generally suggested that visitors are supportive of free or voluntary ATS options, but less receptive to fee-based or mandatory ATS in parks (Holly et al., 2010; Sims et al., 2005; White, 2007), perhaps because of the loss of perceived "freedom" (Dilworth, 2003; Miller & Wright, 1999; Sims et al., 2005). For example, Holly et al., 2010 found that maintaining individual freedom was the most important factor for Acadia National Park visitors when considering whether or not to ride the park shuttle bus. Attitudes toward ATS have also been found to largely depend upon demographic features such as age or family situation, suggesting that older visitors (Dilworth, 2003; Moscardo, Pearce, & Morrison, 2001; Pettebone et al., 2011; Prideaux et al., 2001) or visitors that are traveling with small children are less likely to use ATS (Middelkoop et al., 2003; White, 2007; Youngs et al., 2008). Other studies have found that some visitors perceive an element of safety with ATS, by enabling visitors to enjoy parks while eliminating the responsibility of operating a personal vehicle (Hallo & Manning, 2009). These findings suggest that visitors have a perception of "ease" or lack thereof when choosing whether or not to participate in ATS. Other factors such as crowding on the roadways (Manning et al., 2002; Park Studies Laboratory, 2002; Pettebone et al., 2011) or parking difficulties (Pettebone et al., 2011; White, 2007; Youngs et al., 2008) have been found to affect visitor attitudes toward ATS, suggesting that elements of "stress" may play a role in visitors' choice to use ATS. Knowledge of visitor attitudes and perceptions of ATS can assist park management with

the development of indicators and standards of quality for park transportation and visitor-use frameworks.

ATS Management Frameworks

Visitor-use frameworks rely upon the concept of quality, and are based on the identification of specific indicators and standards of quality, the development of an ensuing monitoring strategy, and the identification of appropriate management actions if standards are reached or exceeded (Manning, 2001; National Park Service, 1997). Indicators are "quantifiable proxies or measures of management objectives" while standards "define the minimum acceptable condition of indicator variables" (Manning, 2007, p. 23). As an example, perceived crowding on roadways has been determined to be a feasible transportation-related indicator of quality for parks (Hallo & Manning, 2009). If an indicator were the number of vehicles experienced per mile, and the number of encounters exceeded the established standard of 10 vehicles, the quality of a visitor's experience may be depreciated. Adaptive management of ATS indicators and standards frameworks allows park managers to effectively facilitate use of ATS and maximize visitor experiences while minimizing resource impacts. Understanding visitor attitudes and perspectives concerning ATS across units, provides management with a more uniform approach to ATS-related user-capacity frameworks.

YOSE and RMNP ATS

The iconic history, high visitation, extensive ATS operations, and recent research within YOSE and RMNP make these NPS units highly conducive for examining visitor attitudes toward ATS. In 1978, with service along the popular Bear Lake corridor, RMNP became one of the first park units to implement ATS, where free shuttle services

have continued each year from early June through early October (Pettebone et al., 2011). Increased visitation and ensuing parking congestion led to an expansion of shuttles and shuttle-related parking infrastructure in 2001. Ridership continued to escalate and reached approximately 270,000 passengers in 2006, when the park expanded services (Hiker Shuttle) to include operation from the bordering town of Estes Park, Colorado (Pettebone et al., 2011). YOSE has also implemented a free ATS in the highly-visited Yosemite Valley, and as part of an effort to reduce reliance on personal vehicles and associated impacts, added a fleet of diesel and electric-hybrid shuttle buses that run daily in the area (White et al., 2011). The shuttles serve several popular Valley attractions and vistas as well as overnight accommodations and concessions. Additionally, free shuttle services operate from Wawona-Mariposa Grove in the spring through fall, Badger Pass ski area during the winter, Tuolumne Meadows, and various nearby hiking trailheads during the summer (http://www.nps.gov/yose/planyourvisit/bus.htm); the Yosemite Area Regional Transportation System (YARTS) offers a fee-based service from surrounding communities into the park (White et al., 2011).

Pettebone et al. (2011) examined factors that affect visitors' decisions to use Bear Lake shuttle service in RMNP by quantifying the proportions of visitors expected to participate in ATS given various visitor experience scenarios involving associated resource and experiential conditions. For example, a visitor may choose to ride the shuttle if they cannot find a parking space at the trailhead. Alternatively, a visitor may decide to wait for a personal parking space at the trailhead if the next shuttle is not scheduled to arrive for another thirty minutes. Results suggested that while personal vehicles were preferred over shuttles, solitude was the most influential variable related to

a visitor's travel choice, and visitors under 40 years of age were more willing than older visitors to make transportation mode trade-offs to improve their chances of being on the trail with fewer visitors. Pettebone et al. (2011) recommended messaging that encourages use of ATS, potentially through real-time intelligent transportation systems (ITS), that notify visitors of traffic and/or parking congestion as well as trail conditions. For example, messaging focusing on less-crowded routes and locations may persuade visitors to use ATS, particularly those under 40 years of age, and older visitors, who may be resistant to shuttle ridership, may be influenced through messaging that enhances the experiential qualities of the shuttle experience (Pettebone et al., 2011).

White (2007) investigated visitor perspectives related to personal vehicle and park shuttle travel behavior in YOSE through 160 semi-structured interviews. Prominent themes emerged that focused on perceived freedom and access, and stressors such as crowding and congestion. Building upon these previous findings, White et al., 2011 evaluated YOSE visitors' perceptions of travelling via ATS and personal vehicle to identify visitor preferences that would inform park management of transportation-related indicators and standards. Results suggested that personal vehicles were the most popular mode of transportation within the park, but visitors were generally satisfied with either transportation experience, personal vehicle or park shuttle. Consistent with previous YOSE findings (White, 2007; Youngs et al., 2008) and other transportation-related research in other NPS units (Davenport & Borrie, 2005; Hallo & Manning, 2009; Sims et al., 2005), results highlight stress, crowding, conflict, freedom, access, and natural experiences as important aspects of the overall transportation experience in YOSE. Three scales were ultimately created from these dimensions (1. stress and conflict, 2.

freedom and access, and 3. nature experience), and the authors recommended that YOSE transportation-related indicators and standards be based on these elements (White et al., 2011). This study advanced understanding of visitor preferences for transportation modes, and informed managers of potential indicators and standards that could be monitored to achieve desired conditions. However, this study offered little understanding of how these findings could be applied to improve visitor participation in ATS.

Research by Pettebone et al., 2011 and White et al., 2011 has advanced understanding of visitor preferences for transportation modes and attitudes toward aspects of the visitor ATS experience, and has identified a suite of factors related to transportation choice in YOSE and RMNP. The purpose of this study was to build upon these findings by contrasting visitor attitudes toward ATS at YOSE and RMNP, in an effort to determine salient attitudinal variables that are perceived similarly across these units. Understanding prevalent attitudes toward ATS allows for the development of messaging strategies that would encourage ridership, further advance understanding of ATS-related indicators and standards of quality, and inform management strategies associated with these salient indicator variables.

Methods

Study Areas and Survey Administration

During the summer of 2007, researchers administered and collected paper surveys (Appendix B) at six locations throughout YOSE including the: (a) Visitor Center in Yosemite Valley, (b) Lower Yosemite Falls, (c) Happy Isles, (d) Tunnel View Overlook, (e) Glacier Point, and (f) Tuolumne Meadows combining for a total sample of $n = 533$. During the summer of 2008, the same methodology was used to obtain a sample of $n =$

811 at four trail locations throughout the Bear Lake corridor in RMNP including: (a) Glacier Gorge, (b) Emerald Lake, (c) Dream Lake, and (d) Alberta Falls. Overall response rates at both YOSE and RMNP were 73%.

Item Measurement

YOSE and RMNP respondents were asked to evaluate attitudes toward ATS based on 21 variables focused on perceived freedom and access, and stressors such as crowding and congestion (Table 3-1). Variables were measured using a 4–point scale, 1 = Strongly Agree to 4 = Strongly Disagree.

Table 3.1
YOSE and RMNP ATS-Related Attitude Variables

Attitude Variables	Strongly Agree	Agree	Disagree	Strongly Agree
1. You have access to your personal belongings				
2. You have an opportunity to learn about the park while traveling				
3. Travel is affordable or low cost				
4. You have opportunities to see wildlife				
5. It is easy to find your way around the park				
6. You have pleasant interactions with other visitors				
7. It takes too long to get where you want to go				
8. You feel safe				
9. You have little impact on the park's natural environment				
10. You connect with the natural environment				
11. You hear natural sounds				
12. You have easy access to different areas of the park				
13. You hear sounds of traffic				
14. It is easy to get to scenic overlooks/vistas				
15. You experience a sense of freedom				
16. You feel stressed while traveling throughout the park				
17. You have trouble finding parking				
18. You can go "where you want, when you want"				
19. You experience conflict with visitors using other kinds of transportation				
20. You avoid traffic congestion				
21. You feel crowded by other visitors				

Data Analyses

Exploratory factor analysis is a common statistical method in the social sciences used to examine a group of related factors within a larger set of variables in order to inform factor structure when little theoretical guidance exists (Henson & Roberts, 2006; Hurley et al., 1997; Vaske, 2008). This technique has been applied and proven useful in

recent protected areas transportation research (Anable, 2005; Choo & Mokhtarian, 2008; Lumsdon, Downward, & Rhoden, 2006). Alternatively, confirmatory factor analysis can be used when sufficient literature and theory guides hypothesized factor structure, which can be tested to determine model fit with observed data (Henson & Roberts, 2006; Hurley et al., 1997; Russell, 2002). Confirmatory factor analysis is a form of structural equation modeling that compares a theoretical model with the observed structure found within a given sample, or multiple samples, when conducting multi-group confirmatory factor analysis (MGCFA) (Milfont & Fischer, 2010).

Gerbing and Hamilton (1996) suggest that EFA can serve as an advantageous precursory "tool to aid the researcher in recovering an underlying measurement model that can then be evaluated with CFA" (p. 71). Similarly, in the Hurley et al. (1997) discussion between experts concerning use of factor analysis, panelist Chet Schriesheim suggested "using EFA and CFA in multiple-sample studies, perhaps first exploring and then confirming" factoral structure (p. 673). Because this study evaluated identical survey variables at two park units with little understanding of how these variables may be perceived by visitors across samples, EFA was chosen first, to guide scale development. Utilizing SPSS 18 statistical software, a principal components EFA was used to define factors across both samples. Subsequently, use of CFA and MGCFA models, which were evaluated using LISREL 8.80 Student Edition software, allowed for empirical testing of measurement invariance between samples to better determine how perceptions of the variables contrasted between YOSE and RMNP respondents.

Variables with similar correlation coefficients that met suggested standards of $\geq .4$ were grouped as suggested factors through the EFA (Vaske, 2008). These factors were

examined separately for the YOSE and RMNP data using reliability analyses, and estimations of internal consistency were evaluated using Chronbach's alpha (α) to determine the proportion of reliability within the scaled survey responses (Vaske, 2008). Suggested factors were proposed and evaluated using CFA on YOSE and RMNP, and ultimately MGCFA was applied with the samples to test whether the survey instrument measured the same psychological constructs across both parks.

Use of MGCFA allows for latent constructs to be tested across groups (i.e., YOSE and RMNP), and requires that each observed variable, such as the attitudinal variables concerning park shuttle experience, relate to the latent constructs in the same manner. MGCFA was used to test for measurement invariance and structural invariance on the proposed group model through a sequenced order of analyses, which constrained the model further with each step (for detailed information concerning these suggested tests see Milfont & Fischer, 2010; Vandenberg & Lance, 2000). The individual CFA's and the series of MGCFA's models for the YOSE and RMNP were determined to have good model fit based on evaluations of chi-square to degrees of freedom ratio (χ^2/df), root mean square error of approximation (RMSEA), comparative fit index (CFI), standardized root mean squared residual (SRMR), normed fit index (NFI), goodness-of-fit index (GFI), and difference in chi-square between incremental models ($\Delta \chi^2$). Fit tests were evaluated based upon previous literature indicating that the χ^2/df range between 2 – 5 (Wheaton, Muthen, Alwin, & Summers, 1977), the RMSEA and SRMR values should range between .06 and .08 (Brown, MacCallum, Kim, Andersen, & Glaser, 2002; Hu & Bentler, 1999; Milfont & Fischer, 2010), the CFI (Bentler, 1990; Hu & Bentler, 1999; Milfont & Fischer, 2010), NFI (Bentler & Bonnett, 1980; Brown et al., 2002) and GFI

equal values of approximately .95 (Brown et al., 2002), and the nested model chi-square difference test $\Delta \chi^2$ results be non-significant (Milfont & Fischer, 2010; Widaman & Thompson, 2003).

Results

Visitor Characteristics

Results suggested that respondent characteristics were similar across both parks. Most respondents were Caucasian, well educated, and from the United States of America. The largest differences occurred with age and country of origin as respondents at YOSE were slightly younger ($M = 43$) than those at RMNP ($M = 47$), and more of the respondents at RMNP were from the U.S (96%) than those at YOSE (76%).

Exploratory Factor Analysis Results

A varimax rotation with factor loadings $\geq .4$ yielded three distinct factors consisting of 10 variables, which loaded similarly across both YOSE and RMNP (Table 3.2). The resulting variables were determined to be related to the latent constructs "ease," "freedom," and "stress." "Ease" consisted of three variables: (a) You feel safe, (b) It is easy to find your way around the park, and (c) You have pleasant interactions with other visitors. "Freedom" also consisted of three variables: (a) It is easy to get to scenic overlooks/vistas, (b) You have easy access to different areas of the park, and (c) You experience a sense of freedom. The last latent construct, "stress" consisted of four variables: (a) You feel stressed while traveling throughout the park, (b) You experience conflict with visitors using other kinds of transportation, (c) You feel crowded by other visitors, and (d) You have trouble finding parking. These factors were then examined separately for the YOSE and RMNP data using reliability analyses, which resulted in

acceptable Chronbach's alphas, respectively (YOSE 'ease' α = .63, 'freedom' α = .67,'stress' α = .72; RMNP 'ease' α = .70, 'freedom' α = .75, 'stress' α = .59).

Table 3.2
Exploratory Factor Analysis Demonstrating Similar Factor Loadings between YOSE and RMNP

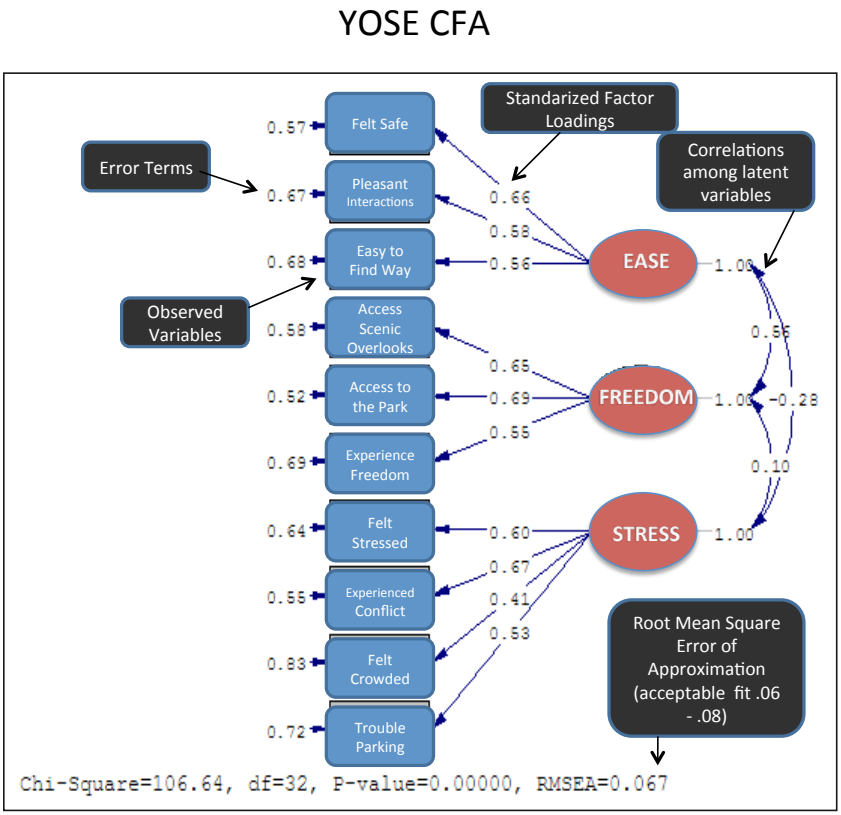
	Factors[1]					
Attitudinal Variables	Ease[2]		Freedom[3]		Stress[4]	
	RMNP	YOSE	RMNP	YOSE	RMNP	YOSE
You feel safe	.714	.681				
It is easy to find your way around the park	.700	.657				
You have pleasant interactions with other visitors	.603	.714				
It is easy to get to scenic overlooks/vistas			.603	.656		
You have easy access to different areas of the park			.581	.590		
You experience a sense of freedom			.558	.684		
You feel stressed while traveling throughout the park					.734	.785
You experience conflict with visitors using other kinds of transportation					.709	.759
You feel crowded by other visitors					.534	.811
You have trouble finding parking					.516	.495

Note. Variables coded on 4-point scale (1 = Strongly Agree – 4 = Strongly Disagree)
[1]Factor loadings represent only coefficients >.4 that rotated out in a similarly across YOSE and RMNP
[2]Chronbach's Alpha for 'Ease' (RMNP α = .70; YOSE α =. 63)
[3]Chronbach's Alpha for 'Freedom' (RMNP α = .75; YOSE α = .67)
[4]Chronbach's Alpha for "Stress" (RMNP α = .59; YOSE α = .72)

Confirmatory Factor Analysis Results

Separate confirmatory factor analysis models were evaluated based on the similar latent constructs and related observed variables for YOSE and RMNP. The model consisted of the latent constructs "ease," "freedom," and "stress," each representing the previously mentioned variables (Table 3.2). Results indicated that the proposed YOSE model (Figure 3.1) was determined to have good model fit based on the following

evaluations: (a) $\chi^2/df = 3.33$, (b) RMSEA = .067, (c) SRMR = .054, (d) CFI = .93 (e) NFI = .90 and (f) GFI = .96. The standardized factor loadings were all ≥ .4, and the latent constructs "ease" and "freedom" were positively correlated. Similarly, "ease" and "stress" were negatively correlated, but "freedom" and "stress" were positively correlated. Despite the positive correlation between "freedom" and "stress," it was determined that the YOSE model had adequate fit.



•Δ χ^2 (χ^2/df) = 3.33 (acceptable between 2-5)

• Comparative Fit Intex (CFI) = .93 (acceptable fi around .95)

• Normed Fit Index (NFI) = . 90 (acceptable fit around .95)

• Root Mean Residual (RMR) = .02 (want between .05 to . 10)

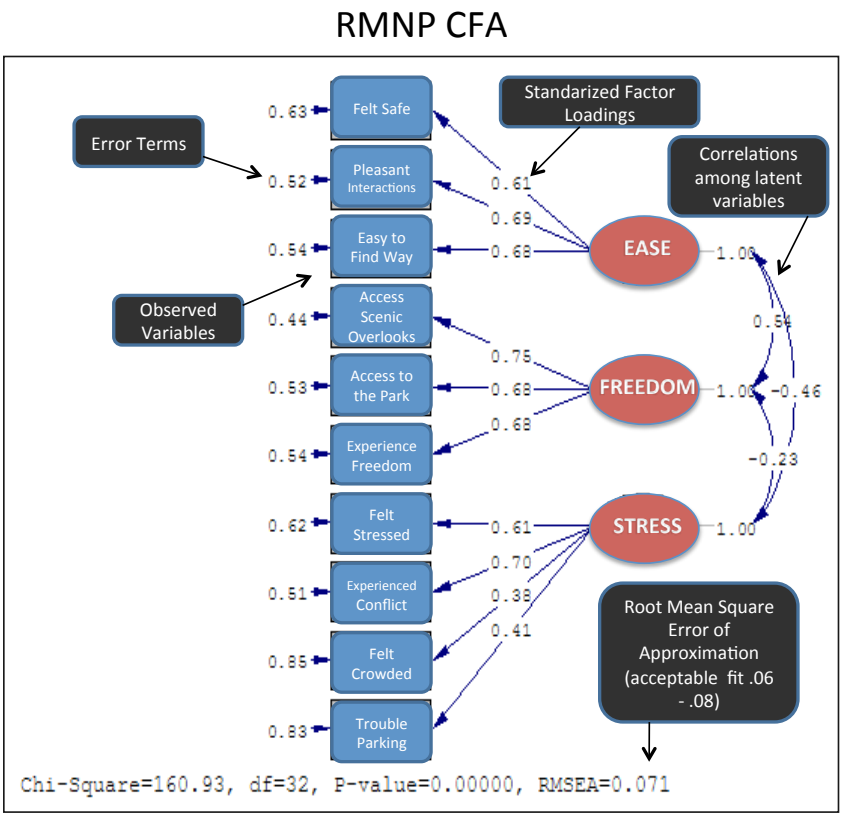
• Standardized Root Mean Residual = .054 (want between .05 to .10)

• Goodness of Fit Index (GFI) = .96 (acceptable fit around . 95)

Figure 3.1: YOSE Confirmatory Factor Analysis Model
Model fit acceptable based on $\chi^2/df = 3.33$; RMSEA = .067; SRMR = .054; CFI = .93; NFI = .90; GFI = .96

Results indicated that the proposed RMNP model (Figure 3.2) was also determined to have good model fit based on the following evaluations: (a) $\chi^2/df = 5.03$, (b) RMSEA = .071, (c) SRMR = .055, (d) CFI = .95, (e) NFI = .94, and (f) GFI = .96. The RMNP model had slightly smaller factor loadings, but all were ≥ .4. Similar to the

YOSE model, the latent constructs "ease" and "freedom" were positively correlated, while "ease" and "freedom" were negatively correlated with "stress."



•Δ χ^2 (χ^2/df) = 5.03 (acceptable between 2-5)

• Comparative Fit Index (CFI) = .95 (acceptable fit around .95)

• Normed Fit Index (NFI) = . 94 (acceptable fit around .95)

• Root Mean Residual (RMR) = .03 (want between . 05 to .10)

• Standardized Root Mean Residual = .055 (want between .05 to .10)

• Goodness of Fit Index (GFI) = .96 (acceptable fit around .95)

Figure 3.2: RMNP Confirmatory Factor Analysis Model
Model fit acceptable based on χ^2/df = 5.03; RMSEA = .071; SRMR = .055; CFI = .95; NFI = .94; GFI = .96

Based upon the similarities between the resulting models, it was determined that a multi-group confirmatory analysis (MGCFA) should be conducted on a combined YOSE and RMNP model. A test of configural invariance, the first model in a series testing measurement invariance, was used to evaluate whether respondents in YOSE and RMNP conceptualized the constructs in the same manner. Results indicated that the combined model, (Figure 3.3), had good fit based on: (a) χ^2/df = 4.18, (b) RMSEA = .069, (c) SRMR = .054, (d) CFI = .94, (e) NFI = .92, and (f) GFI = .96. Furthermore, standardized factor loadings were all ≥ .4, and "ease" and "freedom" were positively correlated, while "ease" and "freedom" were negatively correlated with "stress."

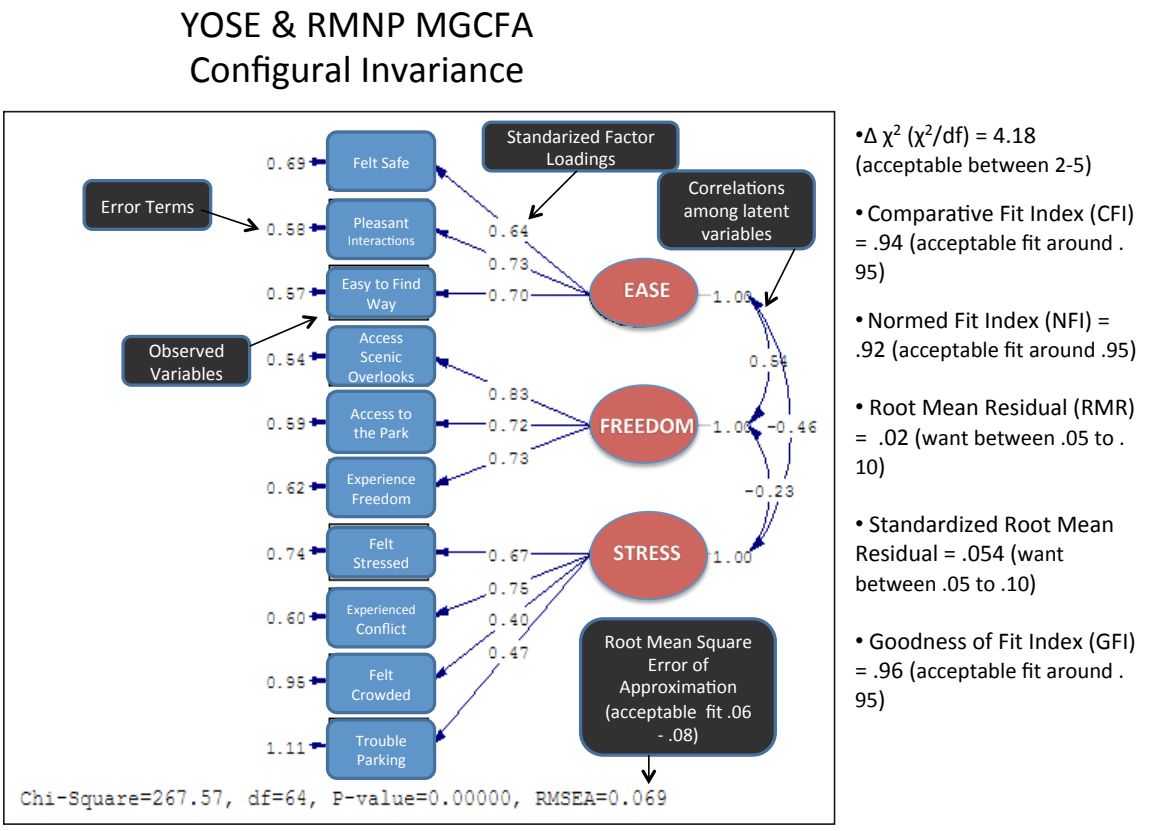


Figure 3.3: YOSE and RMNP Configural Invariance Model
Model fit acceptable based on χ^2/df = 4.18; RMSEA = .069; SRMR = .054; CFI = .94; NFI = .92; GFI = .96

Next, a test of metric invariance, the second model testing measurement invariance, was used to evaluate whether respondents in YOSE and RMNP responded to the attitudinal statements in the same manner. This model is more restrictive than the test of configural invariance because all of the factor loadings are constrained to be the same in YOSE and RMNP (Milfont & Fischer, 2010). Results indicated that the model (Figure 3.4) had good fit based on: (a) χ^2/df = 4.50, (b) RMSEA = .073, (c) SRMR = .10, (d) CFI = .92, (e) NFI = .90, and (f) GFI = .95. Standardized factor loadings were slightly smaller than the previous model test, but all were ≥ .39. Similar to the test of metric invariance, "ease" and "freedom" were positively correlated, while "ease" and "freedom" were negatively correlated with "stress."

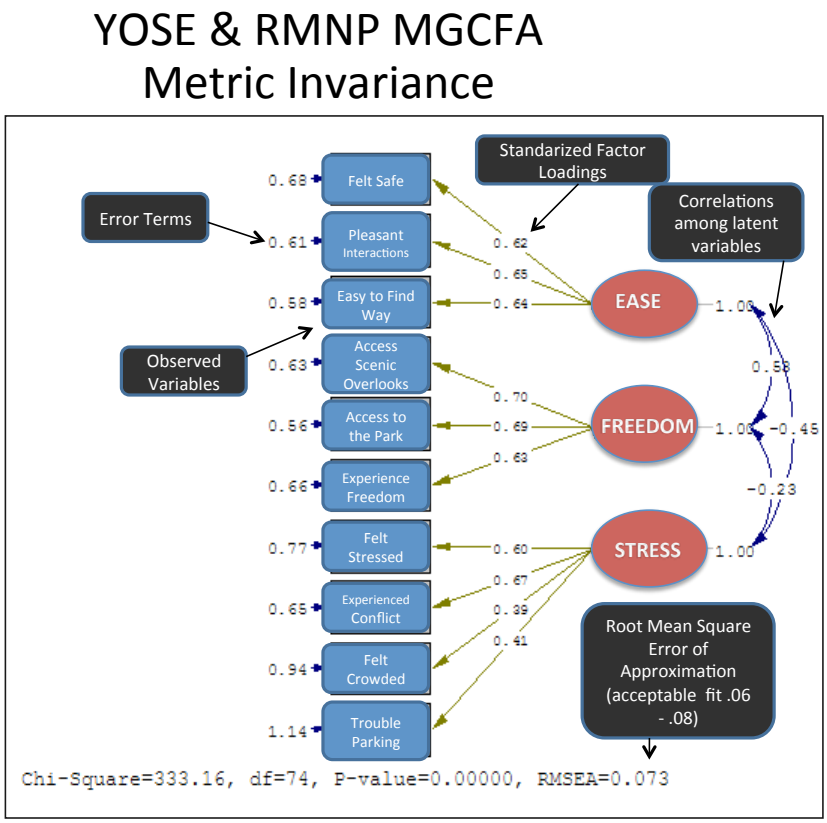


Figure 3.4: YOSE and RMNP Metric Invariance Model
Model fit acceptable based on χ^2/df = 4.50; RMSEA = .073; SRMR = .10; CFI = .92; NFI = .90; GFI = .95

Because both the tests of configural and metric invariance suggested good model fit, the chi-square difference test ($\Delta \chi^2$), was used to evaluate whether the combined YOSE and RMNP model could be tested at the next level, testing scalar invariance. As shown in Table 3.3, the chi-square difference test resulted in a $\chi^2 = 65.59$, which exceeded the critical values of 29.588 based on df = 10, $p < .001$. Results indicated that no additional measurement invariance testing should be conducted, negating the need for the next model evaluation, structural invariance model testing (Milfont & Fischer, 2010).

Table 3.3
Chi-square Difference Test between Configural and Metric Invariance Models

Model	χ^2	Df	χ^2/df	RMSEA	SRMR	CFI	NFI	GFI
Metric	333.16	74	4.50	.073	.10	.92	.90	.95
Configural	267.57	64	4.18	.069	.054	.94	.92	.96
$\Delta \chi^2$	65.59[1]	10						

[1]Difference test value exceeds chi-square critical value of 29.588, based on df = 10, p <.001

Discussion

The purpose of this study was to compare and contrast visitor attitudes regarding ATS at YOSE and RMNP to determine salient attitudinal variables that are perceived similarly at both units, advance understanding of potential indicators and standards of quality related to ATS, and suggest potential management strategies associated with these salient indicator variables. Evaluation of the attitudinal variables yielded three salient factors, which loaded similarly across both YOSE and RMNP, and resulted in the latent constructs of "ease," "freedom," and "stress." "Ease" consisted of elements regarding safety, ease of finding one's way around the park, and having pleasant interactions with other visitors. "Freedom" consisted of being able to get to scenic overlooks or vistas, having access to different areas of the park, and experiencing a sense of freedom. "Stress" consisted of feeling stressed while traveling through the park, experiencing conflict with visitors using other kinds of transportation, feeling crowded by other visitors, and having trouble finding parking.

The results of the MGCFA test of configural invariance suggested that respondents in YOSE and RMNP conceptualized these constructs in a similar manner, and the test of metric invariance indicated that the respondents at both units answered the statements similarly. These results confirm that "ease," "freedom," and "stress" are important factors for park managers to consider when determining indicators and standards of quality, and the associated variables related to these constructs may be applied to the ATS management frameworks at YOSE and RMNP. Previous research also confirms that elements regarding the variables represented by the constructs "ease" (Hallo & Manning, 2009; Pettebone et al., 2011; White, 2007; White et al., 2011),

"freedom" (Dilworth, 2003; Manning & Hallo, 2010; Miller & Wright, 1999; Sims et al., 2005; Pettebone et al., 2011; White, 2007; White et al., 2011), and "stress" (Manning, et al., 2002; Park Studies Laboratory, 2002; Pettebone et al., 2011; White, 2007; White et al., 2011), or lack thereof, with participating park ATS have been found to be important in these and other parks. Coupled with this previous research, these findings further affirm that these variables are pertinent to the ATS-related visitor experiences, and should be employed and tested as potential indicators of quality in YOSE and RMNP, as well as in other units.

"Ease," "freedom," and "stress" represent salient indicator variables that could be used within a visitor-use framework as an adaptive management strategy to effectively facilitate use of ATS and maximize visitor experiences while minimizing resource impacts. For example, with regard to "stress," an indicator of quality variable may be the level of crowding experienced. If the level of crowding exceeds the established standard, appropriate management actions should be taken. These salient indicator variables could also be evaluated in YOSE and RMNP, as well as other NPS units to inspect the current status of ATS systems and assess the role of future ATS applications. For example, an ATS Report Card (Figure 3.5) could easily be administered to ATS riders at RMNP, YOSE and other units to essentially grade ATS operations. This would establish baseline data and allow for subsequent evaluations to determine whether park ATS operations are improving or worsening. If results indicate deficiencies in a particular area, management could focus on improving bus services with regard to these topics. From a social science perspective, this study advances understanding of those variables that are pertinent to the

ATS experience, reducing the visitor/respondent burden for evaluating 21 questions, down to 10 salient variables.

Your Park Shuttle Experience:	***Strongly Agree***	***Agree***	***Disagree***	***Strongly Disagree***
It was easy to find your way around the park			√	
You had pleasant interactions with other visitors	√			
You felt safe	√			
You had easy access to different areas of the park		√		
It was easy to get to scenic overlooks/vistas	√			
You experienced a sense of freedom	√			
You felt stressed while traveling throughout the park				√
You had trouble finding parking		√		
You experienced conflict with visitors using other kinds of transportation		√		
You felt crowded by other visitors			√	

Figure 3.5: Example ATS Park Report Card

The results of this study also suggest that "ease," "freedom," and "stress" represent focused topics in which park management may be able to message to visitors in a manner that increases ATS ridership, and decreases the reliance on personal automobiles. Messaging can be implemented and tested in RMNP, YOSE and other units

focusing upon the "ease," "freedom," and lack of "stress" associated with taking the shuttle. For example, with regard to "freedom" and "stress," the park may implement a message stating, "Avoid traffic stress ---- park here and let our free buses take you to the scenic overlooks". Or with regard to "ease," a message that states "Let our buses safely guide you around the park" may be appropriate. Use of ITS, which has been beneficial in other park units (Daigle & Zimmerman, 2004a; 2004b; Dilworth & Shafer, 2004; Zimmerman, Coleman, & Daigle, 2003), may be the most applicable approach to message dissemination.

Once visitors are aboard shuttles, there are additional opportunities for educational messaging through bus drivers (Manning & Hallo, 2010), on-board interpretive staff, or signage within the bus interior. Messaging that could encourage future ridership might focus on the benefits of riding the shuttle such as improved air quality, noise reduction, or overall improved resource protection (Laube & Stout, 2000; Turnbull, 2003). Messaging that focuses on ethical visitor behaviors, such as those prescribed through the Leave No Trace Center for Outdoor Ethics (LNT) may also be appropriate within the shuttle buses, and thus, improve rider experiences. The federal land agencies have already adopted the ethics promoted through LNT, and the seven LNT Principles can currently be seen at most park trailheads and within informational literature. Additional promotion of behaviors that encourage pleasant interactions with other visitors, which is largely encompassed by the LNT Principle, "Be Considerate of Other Visitors," would target aspects of the "ease" variable examined within this study. Signage within and around the shuttle buses, indicating the amount of days without an accident, may encourage ridership by emphasizing the safety aspect of riding the bus,

which was a component of the "ease" construct. Utilizing messaging that incorporates these variables within the shuttle bus provides for yet another way to improve visitor experiences with regard to ATS, and encourages future ridership.

Park planners may also integrate aspects of "ease," "freedom," and "stress" into current infrastructure and consider constructing future developments around these concepts. For example, routes should be focused on enabling visitors to access scenic overlooks or vistas, and management may consider allowing only buses access to certain overlooks or attraction sites. This would encompass both the "ease" and "stress" constructs by considering access, and potentially reducing perceived conflict with personal vehicle drivers. This may also be perceived as an additional incentive to ride the shuttle bus. Management and planners should examine techniques to avoid crowding on buses, while not creating long queues and wait times that would deter ridership participation (Holly et al., 2010). This may also mitigate crowding on trail segments by limiting large quantities of people exiting buses and entering trails simultaneously (Lawson et al., 2011; Pettebone et al., 2011). Additionally, ample parking availability at shuttle bus hubs should be an important consideration to minimize visitor stress.

Study Limitations and Future Research

Evaluation of the EFA indicated that 10 attitudinal variables factored out similarly, and the separate CFAs resulted in very similar model fit. Additionally, the results of the MGCFA indicated that both configural and metric invariance suggested good model fit. However, the test of scalar invariance, the next evaluation within the MGCFA sequence, did not indicate appropriate model fit. The later indicated that the proposed combined models were not exactly the same at YOSE and RMNP. This

suggests that the proposed constructs of "ease," "freedom," and "stress" discussed here were perceived very similarly, but not exactly in the same manner at both units.

Perhaps YOSE and RMNP ATS provide for slightly different visitor experiences given the nature of the units themselves. While the shuttle systems in both YOSE and RMNP provide transportation for mostly day-users in some of the parks' most popular destinations, the YOSE Valley is very different than the Bear Lake corridor in RMNP. The shuttle system in the YOSE Valley passes by iconic waterfalls and monolithic rock faces while also navigating through occasional traffic congestion attributed largely to the park's historic hotels, camps and stores. The YOSE shuttle experience is largely based around transporting visitors to and enabling sightseeing of Valley attractions such as El Capitan, Half Dome, and Yosemite Falls. The shuttle system along the Bear Lake corridor in RMNP offers magnificent views of moraines and snow-covered peaks towering above 14,000 feet, but it does not have a sightseeing focus nor does it have the infrastructural traffic that challenges YOSE. Instead the RMNP shuttle experience is largely focused on taking visitors to and from the trailheads within the Bear Lake corridor.

Given the differences in shuttle purpose and associated visitor experiences, it is encouraging and significant that the results of this study found such substantial similarities between these parks. But because the full sequence of model testing did not meet the suggested fit for all of the MGCFA examinations, as suggested by Gerbing and Hamilton (1996), we advise that these variables be evaluated and "cross-validated on new data" (p. 71). Based on the results of this study using EFA across two park units, followed by empirically testing model fit through CFA and MGCFA, we suggest that

future analyses of these variables be tested only through confirmatory measures. For example, these variables should be evaluated in other park units, and other types of protected areas such as U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (FWS), and Bureau of Land Management (BLM) lands (Turnbull, 2003).

Finally, we acknowledge that these salient attitudes are predicated by other factors related to visitor characteristics. Previous research has suggested that additional variables such as age (Dilworth, 2003; Moscardo et al., 2001; Pettebone et al., 2011; Prideaux et al., 2001), family situation (Middelkoop et al., 2003; White, 2007; Youngs et al., 2008) and motivation affect visitor perceptions of ATS, and should also be considered when researching and managing ATS.

Conclusion

The NPS is increasingly using ATS to accommodate high visitation and mitigate resource and social impacts. Given the historical relationship between personal vehicles and parks, little is known concerning how the shift to ATS affects visitor experiences; visitor attitudes toward ATS largely determine participation in shuttle services. This study evaluated visitor attitudes at YOSE and RMNP to improve understanding of salient attitudinal constructs related to ATS in parks. Findings suggest that the concepts of "ease," "freedom," and "stress" are important salient factors related to ATS in both parks, and may be employed and tested in these and other park units. The constructs of "ease," "freedom," and "stress" and the ten salient underlying variables associated with these factors should be considered as pertinent indicators and standards of quality for ATS visitor-use management frameworks. Additionally, communication strategies that encompass these concepts may increase ridership and improve current ATS visitor

experiences. Finally, management should take these variables into consideration when modifying current infrastructure or planning future ATS operations.

CHAPTER IV

The Role of Messaging on Acceptability of Military Aircraft in Sequoia National Park

Introduction

Mandates such as the 1972 Noise Control Act, the 1987 National Parks Overflights Act, and recent National Park Service (NPS) policy directives require the protection of the acoustic environment as a resource, similar to that of the flora and fauna present in our national parks, and specifies that parks should integrate monitoring and planning efforts to protect park soundscapes (Newman et al., 2010). Accordingly, the NPS Natural Sounds and Night Skies Division, which is dedicated to the protection of the acoustic environment, has begun to improve monitoring and planning efforts in many units, such as Grand Canyon National Park, Muir Woods National Monument, and Sequoia and Kings Canyon National Parks (Keizer, 2008).

Due to its proximity to military installations, military aircraft are prevalent above Sequoia and Kings Canyon National Parks (SEKI), and exposure to sounds produced by aircraft have been found to negatively detract from visitor experiences (Krog & Engdahl, 2005; Mace et al., 1999; 2004; Mace et al., 2003; Miller, 1999; Miller et al., 1999; Tarrant et al., 1995). SEKI staff have instituted multi-day "Wilderness Orientation Overflight Pack Trips" in which they take military officials into the backcountry to increase understanding of the effects of aircraft noise on the park resources and its visitors, leading to improved cooperation between federal entities (Keizer, 2008).

Despite these advances, military overflights and associated acoustic impacts are likely to continue given SEKI's proximity to military installations, and in turn, visitor

experiences may be depreciated. This provides reasoning and need for effective management strategies that mitigate adverse effects of military aircraft sounds in SEKI. Indirect management such has educational information can effectively reshape visitor attitudes so that they are more supportive of management actions and policies (Manning, 2003). Could educational messaging alter visitor expectations and perceptions of military aircraft sounds in SEKI? Would informing visitors that they may hear or see military aircraft while recreating in SEKI increase or decrease acceptability of this anthropogenic sound intrusion? The purpose of this study was to 1) determine if indirect management actions in the form of educational messaging can significantly affect visitor acceptability and normative evaluations of quality pertaining to military aircraft sounds, 2) enhance understanding of the strength of educational messaging as it pertains to soundscape management, and 3) suggest potential educational messaging strategies that may be applied in SEKI and other NPS units.

Soundscape Management – Indicators and Standards

The majority of Americans consider opportunities to experience the sounds of nature as an important reason for protecting national parks (Haas & Wakefield, 1998). Research suggests that visitors often retreat to parks to experience the sounds of nature, such as wind, water, and natural quiet (Driver et al., 1991; Haas & Wakefield, 1998; Mace et al., 2003; McDonald et al., 1995). Anthropogenic sounds, such as loud voices, vehicles, and aircraft have been found to negatively detract from visitor experiences by masking the sounds of nature (Bell et al., 2010; Benfield et al., 2009; Krog & Engdahl, 2005; Mace et al., 2003; Miller, 1999; Miller et al., 1999; Pilcher et al., 2008; Tarrant et al., 1995).

Anthropogenic sounds can cause resource and social impacts, and mandates require the NPS to preserve the natural soundscape as a resource (Ambrose & Burson, 2004; Jensen & Thompson, 2004; Newman et al., 2010), therefore requiring managers to determine how much change should be allowed within the environmental resources, recreation experiences, and the resulting management actions. This requires that descriptive (focusing exclusively on unbiased data) and evaluative (subjective measure) components be addressed, so that management objectives (desired conditions) and ensuing indicators and standards of quality can be established (Manning, 2007). Indicators are "quantifiable proxies or measures of management objectives," while standards "define the minimum acceptable condition of indicator variables" (Manning, 2007, p. 23).

Recent research has helped inform the NPS concerning effective sound-related indicators and standards of quality that help managers protect, maintain, and restore the natural acoustic environment. Pilcher, Newman, and Manning (2008) conducted a two-phase study in Muir Woods National Monument in which sound-related social indicators and standards of quality were established. Phase-one focused upon descriptive evaluations, by asking respondents to listen to the surrounding environment, and to determine the degree to which sounds heard were pleasing or annoying. The results of phase-one suggested that visitor-caused sounds such as groups talking, were frequently heard, and rated as annoying, and therefore would be a good indicator of quality. Phase-two focused upon the evaluative component by specifically addressing varying levels of visitor-talking sounds to determine respondents' threshold, and subsequently established a standard of quality. A series of soundclips were created from the recordings of the area,

each containing varying levels of visitor-talking sounds. Respondent evaluations of these soundclips determined that sound pressure stemming from visitors talking at a level of 38 decibels or greater, was unacceptable. Correlating this established standard with acoustic monitoring data, the researchers suggested that visitor standards were being violated at least a portion of the time, potentially degrading the quality of the visitor experience. Potential management actions were suggested, such as indirect messaging, which could be implemented in the study area to alter visitor behaviors and decrease visitor-caused noise.

Soundscape Management – Educational Messaging

A subsequent experimental study in Muir Woods National Monument addressed strategies for managing visitor-caused sounds by implementing simple signage denoting either a "quiet zone" or a "quiet day" (Manning et al., 2010; Stack, 2008; Stack et al., 2011). Based upon the previously-defined indicators and standards, as well as acoustic monitoring data for the area (Pilcher, et al., 2008), the researchers and park managers were able to effectively lower the amount of human-caused noise. Consequently, educational messaging in the study area stating "quiet day" led to the acoustic decrease equivalent to 793 people, while the "quite zone" signage led to the acoustic decrease equivalent to 1150 people within that study area (Stack, 2008). Implementation of "quiet zone" messaging decreased visitor noise by 3 A-weighted decibel levels (dBA), essentially doubling a visitor's listening area (Stack et al., 2011). The results of this study demonstrate the positive influence indirect management, such as educational messaging, can have on visitor behaviors and preservation of park soundscapes. This study advanced understanding of how educational messaging can alter visitor behaviors.

However, there has been limited research that evaluates the role of messaging in modifying visitor perceptions and evaluations of sounds.

Using a college psychology laboratory, Mace, Bell, Loomis, and Haas (2003) began to investigate this deficiency by examining how contextual messaging may change evaluations of helicopter noise within park settings. Using simple messages notifying participants that the helicopter sounds which they were evaluating could be attributed to "tourist overflights," "backcountry maintenance operations," and the "rescue of a backcountry hiker," the researchers determined whether contextual factors affected evaluative judgment of the noise. Findings indicated that regardless of which reason attributed to the sound, amplified helicopter noise resulted in lower evaluations of the park setting and greater levels of annoyance, suggesting that park management-related noise disturbances are just as annoying as other aircraft noise sources. This study advanced understanding of how messaging may or may not influence perceptions and evaluations of sounds in parks; however, the study was conducted solely within a laboratory setting with college student respondents who evaluated only helicopter noise. Despite previous research suggesting that lab and field-based evaluations are similar (Malm, Kelley, Molenar, & Daniel, 1981; Stamps, 1990), the messaging applied in this study may not have induced elaboration among the participants, and we speculate that there may be two reasons why messaging did not alter evaluations. First, the messages may have lacked relevance, given that the respondents were not visitors in the evaluated parks. Second, the messages were simplistic (i.e., "tourist overflights," "backcountry maintenance operations," and the "rescue of a backcountry hiker") and may not have contained enough information to influence respondent attitudes.

Miller, Anderson, Horonjeff and Thompon (1999) evaluated messaging concerning military aircraft and associated noise impacts in a park setting to determine if messaging could alter expectations and perceptions. This cooperative study between the US Air Force and the NPS at White Sands National Monument evaluated whether informing visitors that they may hear or see aircraft would reduce adverse effects of military aircraft on park visitors (Miller, et al., 1999). Approximately half of the visitors sampled were exposed to an NPS-formatted sign with a neutral message stating, "Military aircraft can regularly be seen or heard on this trail" (Miller et al., p. 6). Only 40% of respondents that could have seen the sign remembered seeing the message, but of that subset, results suggested that information decreased respondent annoyance by approximately 10% (Miller et al., 1999). The message applied in the study was not based on theoretical communication frameworks, but instead, was created with neutrality in mind, so as not to provide a subjective evaluation of the presence of military aircraft (Nick Miller, personal communication, 11/30/11). The findings suggested that informative messaging could affect perceptions and evaluations of aircraft, even by using a non-theoretically based, neutral message. These results could potentially be limited due to the location of White Sands National Monument—it is surrounded by White Sands Missile Range and Holloman Air Force Base. This location indirectly requires that visitors travel through the missile range in order to reach the park entrance, suggesting that some visitors to the park may have already been aware of the presence of military and associated sounds. This potential limitation does not negate the effectiveness of educational messaging, but warrants further investigation within a park setting in which the presence of military aircraft would not be as obvious.

The results of these studies suggest that educational messaging can be applied as an effective management strategy to decrease anthropogenic noise, and potentially alter perceptions of anthropogenic sounds depending upon the context and environment in which sounds are heard. These studies have advanced understanding of the role of messaging, but have applied little theoretical basis to message design. Furthermore, applying educational messaging in a park in which visitors may not be as readily cognizant of the presence of military aircraft, may result in different acceptability of associated sounds. This study builds upon previous research by designing an informative message based upon theory, and determining if that message has the potential to alter attitudes, perceptions, expectations, and therefore standards of quality concerning military aircraft sounds.

Theoretical Basis

Elaboration Likelihood Model

The Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1981; 1986) is one of the most prominent theoretical approaches applied to influence visitors in parks and protected areas (Absher & Bright, 2004). This model postulates that there are two routes to persuasion: the central, which likely occurs through thoughtful, motivated consideration of information, and the peripheral, which induces change without perusal of information (Petty & Cacioppo, 1986). ELM focuses upon the processes by which message features influence attitudes (Booth-Butterfield & Welbourne, 2002) by better understanding the level of elaboration (i.e., extent to which a message is scrutinized) that a particular communication strategy has upon an individual (Petty & Cacioppo, 1986). Perhaps most importantly, central route attitude change demonstrates "greater resistance

to counter-persuasion than attitude changes that result mostly from peripheral cues" (Petty & Cacioppo, p. 21, 1986).

Educational communication strategies in parks and protected areas often rely on central route processing (Marion & Reid, 2007), but situational and personal variables like motivation, message relevancy, potential distractions, ability, previous experiences, and knowledge all affect the level of elaboration, and determine whether central or peripheral processes occur (Petty & Cacioppo, 1986; Booth-Butterfield & Welbourne, 2002). Effective messaging design requires consideration of variables that are thought to enhance and motivate understanding such as personal relevance, personal responsibility, the number of messages, and message sources (Petty & Cacioppo, 1986). While interpretive strategists cannot always reach visitors due to situational and personal variables, developing messages that are strong and impactful, by making them relevant to the visitor (Ham, 2007; Ham et al., 2009), may lead to more central route processing.

Argument Strength

Strong messages, or messages that contain substantial argument strength, can stimulate and enhance elaboration (Petty & Cacioppo, 1986). Strong messages provide relevant, reasonable, quality information that can be used to influence attitudes. Alternatively, weak messages lack argument strength and therefore are not as effective in triggering elaboration (Petty & Cacioppo, 1986; Petty & Wegener, 2008). Attitudes that align or *match* with presented information are thought to be strengthened with strong arguments, while recipient attitudes that *mismatch* may not change if the message does not have the strength to stimulate elaboration (Petty & Wegener, 2008; Lavine & Snyder,

1996; Wood, 2000). Furthermore, framing arguments to trigger recipient values or goals increases elaboration potential and likelihood of attitude change (Wood, 2000).

Argument strength and framing can be tested through elicitation studies, in which a small sample of respondents evaluate a series of potentially useable statements, to determine which are perceived as containing quality, relevant, stimulating information (see Petty & Cacioppo, 1986, and Petty & Wegener, 2008). Those messages that exhibit the most effect, are typically the strongest, and have the most significant power to influence attitudes (Petty and Cacioppo, 1986; Petty & Wegener, 2008). Furthermore, impactful messages contain qualities that will increase the prospect of elicitation, potentially altering mismatching attitudes and increasing attitudes that already align with the concepts presented (Lavine & Snyder, 1996; Petty & Cacioppo, 1986; Petty & Wegener, 2008; Wood, 2000; Ziegler et al., 2007).

Methods

This study originates from findings from a two-phase evaluation to determine social indicators and standards of quality pertaining to sounds in SEKI. During phase-one, a visitor survey was conducted at SEKI in the summer of 2009 to explore the descriptive component, yielding a total $n = 537$ and a total response rate of 72% (Marin, 2011). A listening exercise to determine indicators of quality suggested that approximately 50% of respondents heard aircraft, and approximately 72% of those found the associated sounds to be unacceptable (Newman, Lawson, Marin, & Taff, In Review). These findings led to phase-two, this study, which applied a theoretically-based educational message and military aircraft soundclips, to evaluate visitor standards related to aircraft sounds in SEKI.

Elicitation Study

An elicitation study was used to determine which informative message should be applied during phase-two. To evaluate message strength, a series of three messages, ranging in persuasion and argument strength were tested during the spring of 2010 using a paper survey instrument (Appendix C). Thirty-eight undergraduate natural resources students at Colorado State University were asked to evaluate how hearing or seeing aircraft flying overhead during a visit to SEKI, would affect their experience. The students were then informed that they would be presented with three messages intended to provide information to park visitors about potential reasons for hearing and/or seeing aircraft while in the park. The message which resulted in the strongest argument strength, and therefore effect on respondents' acceptability was '*Military aircraft are allowed to conduct training flights over Sequoia National Park in an effort to help keep the United States of America safe. Consequently, visitors hiking in this area of the park can sometimes hear/and or see military aircraft flying overhead'*. This message was then applied at SEKI during phase-two, to determine the effect of messaging on respondent acceptability and standards of quality pertaining to military aircraft.

Study Area

Located in south-central California, SEKI was established in 1890, long before the presence of military aircraft. Current visitation now exceeds one million visitors (NPS Statistics 2010), many of who escape to this iconic park to experience the sounds of nature (Marin, Newman, Manning, Vaske, & Stack, 2011). SEKI is in near proximity to many military installations such as Lemoore Naval Air Station, China Lake Naval Air Weapons Center, and Fort Irwin National Training Center for the US Military, as well as

bases across the border in Nevada such as Nellis Air Force Base and the military test ranges associated with Area 51. Despite condition improvements stemming from collaboration between SEKI and military officials (Keizer, 2008), military overflights and associated acoustic impacts are likely to continue. Furthermore, previous research suggests that SEKI visitors are hearing aircraft, and the majority find associated sounds unacceptable (Newman et al., In Review), providing greater rationale for this study.

Survey Administration

Sampling took place at SEKI's Crescent Meadow and Wolverton trailheads during the summer of 2011, yielding a total $n = 146$ and a response rate of 88%. Willing respondents were asked to complete an on-site paper survey instrument (Appendix D and E) after listening to a series of soundclips that represented sounds found within the park.

Item Measurement

Two questionnaire versions were used in the study in order to test the effect of messaging on acceptance of military aircraft sounds. Prior to respondents' rating the acceptability of soundclips, the "primed" survey ($n = 74$) provided the message that was established through elicitation methods, informing visitors about military aircraft (Appendix D). This was followed by instructions asking visitors to indicate how acceptable it would be to hear the following sounds while hiking in this area of the park. The "unprimed" survey ($n = 72$) only asked respondents to indicate how acceptable it would be to hear the following sounds while hiking in this area of the park, without any mention of military aircraft (Appendix E). The acceptability of the aircraft soundclips was rated on a 9-point scale (-4 = Very Unacceptable; 0 = Neutral; 4 = Very Acceptable).

Military Aircraft Soundclips

The soundclips evaluated during this study were extracted from actual recordings of SEKI with the National Park Service Sounds and Night Skies Division acoustical monitoring equipment during July and August of 2009. Sound events were analyzed and extracted into MP3 format using SPLAT and Adobe Audition 1.0 with the assistance of the staff at the NPS Division office. Clips were chosen to typify both natural ambient and military aircraft overflight episodes from several days and times, so as to represent various potential visitor experiences at Sequoia. Only clips with wind speeds < 1.14 meters/second were chosen to negate masking effects. Ultimately, five forty-second A-weighted soundclips, ranging in decibel levels, were chosen for field application. A-weighted decibel (dBA) levels can be measured and developed by merged sound energy using a weighted function, which adjusts sound pressure levels to allow for human hearing (Ambrose & Burson, 2004; Fahy, 2001; Fristrup, 2010; Stack, et al., 2011). One recording clip contained natural ambient sounds from the park, consisting predominantly of wind, birds, and water, which were at max level, 28 dBA. The additional four recordings contained both natural ambient sounds masked by military aircraft, which resulted in varying levels of sound pressure ranging at a peak of 66 dBA down to 33 dBA. The soundclips were played for the respondents through noise-cancelling headphones beginning with the natural ambient recording, followed by the 66 dBA, the 53 dBA, the 46 dBA, and 33 dBA military aircraft recording.

Data Analyses

Independent samples t-tests were used to determine if messaging statistically affected acceptance of military aircraft sounds. Statistical and practical significance was

examined through consideration of *p*-values, Eta values, and the importance of the mean differences between the primed and unprimed samples.

Results

Primed versus Unprimed

Recording one, which contained natural ambient sounds from SEKI, but no military aircraft, resulted in similar, non-statistically different mean values between the "primed" and "unprimed" samples (Primed $M = 3.59$, Unprimed $M = 3.63$) (Table 4.1). Recording two, which contained military aircraft peaking in sound pressure at 66 dBA resulted in statistically-different mean values between respondents notified of the presence of military aircraft and those that were not (Primed $M = -.08$, Unprimed $M = -1.42$, $p = .001$, $\eta = .272$). Recording three, which contained military aircraft peaking at 53 dBA also resulted in statistically-different mean values between "primed" and "unprimed" respondents (Primed $M = -.31$, Unprimed $M = -1.64$, $p = <.001$, $\eta = .284$). Recording four, which consisted of military aircraft sounds peaking in sound pressure at 46 dBA also resulted in statistically-different mean values between samples (Primed $M = .12$, Unprimed $M = -.97$, $p = <.001$, $\eta = .230$). Recording five, which contained the lowest level of military aircraft sound pressure peaking at 33 dBA, also resulted in statistically-significant differences between "primed" and "unprimed" respondents (Primed $M = .18$, Unprimed $M = -.65$, $p = .005$, $\eta = .169$) although the effect size suggests a minimal relationship. Three of the four soundclips that contained military aircraft resulted in statistically-significant mean differences with typical effect sizes between samples.

Table 4.1
Comparison of Primed (Respondents notified of military aircraft presence through messaging) and Unprimed (Respondents not informed of military aircraft presence) visitors at Sequoia National Park

Soundclips	Sample	*N*	Mean	SD	*t*-value	*p*-value	Eta (η)
Recording 1 – peak 28 dBA natural ambient wind, water, and bird	Primed	74	3.59	1.0	-.170	.719	.014
	Unprimed	72	3.63	1.2			
Recording 2 – peak 66 dBA natural ambient masked by military aircraft	Primed	74	-.08	2.6	3.40	.001	.272
	Unprimed	72	-1.42	2.1			
Recording 3 – peak 53 dBA natural ambient masked by military aircraft	Primed	74	-.31	2.5	3.60	<.001	.284
	Unprimed	72	-1.64	2.0			
Recording 4 – peak 46 dBA natural ambient masked by military aircraft	Primed	74	.12	2.6	2.90	<.001	.230
	Unprimed	72	-.97	2.0			
Recording 5 – peak 33 dBA natural ambient masked by military aircraft	Primed	74	.18	2.6	2.10	.005	.169
	Unprimed	72	-.65	2.2			

Note. Variables coded on a 9-point scale (-4 = Very Unacceptable; 0 = Neutral; 4 = Very Acceptable)

Soundclip Acceptability

Results suggest that both "primed" and "unprimed" respondents found the natural ambient soundclip to be very acceptable (Figure 4.1), but upon hearing soundclips two and three, mean values dropped below acceptability for both samples. Evaluation of soundclips four and five resulted in mean values that were acceptable for "primed" respondents, but "unacceptable" for unprimed respondents. "Primed" respondents' mean acceptability of the military aircraft soundclips was approximately 15% more acceptable

than “unprimed” respondents for recording two and three, and 9% more acceptable for recordings four and five.

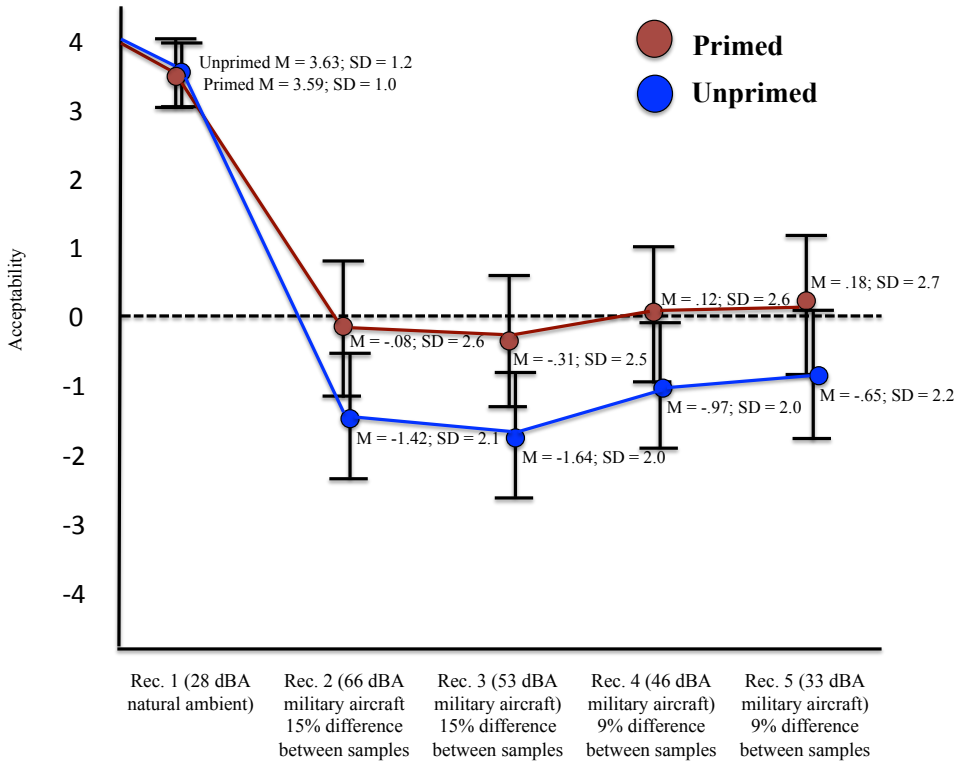


Figure 4.1: Plotted trend comparing primed and unprimed respondent acceptability of military aircraft soundclips

Discussion

The purpose of this study was to determine if indirect management actions in the form of educational messaging could significantly affect visitor acceptability and normative evaluations of military aircraft sounds. Subsequently, our goal was to increase understanding of the strength of educational messaging and to discuss how it may be applied to soundscape management in SEKI and other units. This study demonstrated that a theoretically-based and tested message could be applied in a park unit to effectively

alter visitor attitudes, perceptions, expectations, and therefore, normative evaluations of quality concerning military aircraft sounds.

Educational messaging is one of many indirect management tools that may assist managers to protect, maintain, and restore the natural acoustic environment and visitor experiences. This study, along with previous soundscape messaging research (Mace et al., 2003; Manning et al., 2010; Miller, et al., 1999; Stack, 2008; Stack et al., 2011) increases managers' understanding of the strength of educational messaging as it pertains to soundscape management. Through theoretical development and elicitation testing, the strongest message was chosen and applied in this field study. This message did increase acceptability of military aircraft sounds by as much as 15%, suggesting that educational messaging may offer immediate benefits to SEKI visitor experiences. These significant results do not necessarily suggest that the evaluated message should be implemented in SEKI, but instead demonstrate how messaging can affect visitor perspectives and evaluations of aircraft sounds.

Given the improved relations and ensuing collaborative efforts between NPS and military staff to protect SEKI's soundscape, the findings of this study provide these officials with additional tools to manage visitor experiences as they pertain to park soundscapes. The results suggest that this message could be implemented permanently to improve acceptability of military aircraft, or perhaps used on selective occasions when military overflights might be more prevalent. Whether NPS officials and SEKI managers chose to employ this message or not, we recommend that any implementation of educational messaging rely upon elements of the ELM framework for the most effective influence. ELM provides greater understanding of the challenges managers may face

when attempting to communicate with visitors, and suggests strategies for stimulating central route processing. While managers cannot always reach visitors due to situational and personal variables, developing messages that are relevant, strong, and impactful (Ham, 2007; Ham et al., 2009), may lead to more central route processing.

The effectiveness of soundscape-related messaging efforts should be greater when multiple methods of communication (e.g., trailhead signage, brochures, interpretive presence) are provided (Stack et al., 2011). Any message design should maintain the appearance of current NPS messaging to induce greater perceived source credibility among recipients. Messages should be implemented and evaluated through temporary placement, near areas which tend to be most problematic, to determine how they affect visitor behaviors and experiences. For example, in SEKI, areas where visitors have reported hearing aircraft and finding those associated sounds unacceptable, may be the most appropriate locations for temporary messaging. Those messages that are found to assist with soundscape protection and improve visitor experiences could be employed more permanently. At Muir Woods National Monument, the effective results of experimental messaging through temporary signage led to designation of a permanent quiet zone within the study area (Stack et al., 2011).

Limitations and Future Research

As with all experimental research, this study has limitations. The sample size of this study is relatively small given annual visitation to SEKI, which now exceeds one million visitors (NPS statistics, 2010). The evaluated message was provided only to respondents through the "primed" survey, with no additional communication diffusion (e.g., trailhead signage, brochures, interpretive ranger talk). Additional research should

evaluate other communication strategies in problematic areas to determine if these effects are salient, and which method is most and least effective. Following the natural ambient soundclip, respondents in this study were provided military soundclips in descending order, which may have produced an order effect, similar to order bias discovered through visual/photo methods (Gibson, 2011). Despite trends that suggest that visitors were generally less accepting of louder than quieter military aircraft (Figure 4-1), soundclip order should be evaluated in future studies. This study only tested soundclip acceptability at SEKI, but other NPS units that experience predominantly military aircraft overflights, such as Death Valley National Park, City of Rocks National Reserve, Oregon Pipe National Monument, and John Day Fossil Beds National Monument (Vicki McCusker, personal communication 11/28/11) should also be evaluated to determine salience. Messaging concerning the presence of other types of aircraft (e.g., commercial or air-tour) should be tested in units that experience those predominate events to determine if educational information has a similar effect on visitor perceptions.

We acknowledge that these results only relate to improved social aspects pertaining to visitor experiences, and do not directly improve resource protection or preservation. However, we would hope that if messaging were implemented, it would increase visitor understanding concerning the importance of soundscape protection. We also acknowledge that informing visitors may also negatively impact some visitor experiences. For example, some individuals may not have previously noticed aircraft sounds, even if aircraft were present during their visit, and a message may prime those visitors, and in turn, negatively affect their experience. While stronger messages can provide greater elaboration even when attitudes mismatch, this message may produce

more fervent attitudes in individuals who hold attitudes that misalign with the concepts provided through the tested message. These individuals may in turn become agitated with the NPS for providing the message. Despite these limitations, the results of this study demonstrate the strength of a theoretically-derived message on visitor perspectives.

Conclusion

This study demonstrated how messaging can have a profound effect on visitor perspectives concerning aircraft in SEKI. The results of this study determined that informing visitors about the presence of military aircraft through a theoretically-derived educational message could improve acceptability and alter normative evaluations of military aircraft sounds by as much as 15%. The educational message provided to "primed" respondents resulted in statistically-significant differences in acceptability compared with respondents that were not informed about the presence of military aircraft. "Unprimed respondents" who did not receive the message, found all soundclips that contained military aircraft to be unacceptable. However, priming respondents improved acceptance of military aircraft sounds that peaked at 33 dBA and 46 dBA to an acceptable level, suggesting that the tested message could alter visitor evaluations of military aircraft at SEKI. These results indicate that educational messaging may offer immediate benefits to SEKI visitor experiences.

Indirect management in the form of educational messaging is one of many management tools that may assist managers to protect, maintain, and restore the natural acoustic environment and visitor experiences. This study adds to the growing body of literature that has increased knowledge of soundscape management in parks. The results

improve understanding of how messaging can be applied to park issues by demonstrating that educational messaging may offer immediate benefits to visitor experiences in SEKI.

CHAPTER V

The Value of Messaging for Park Management

The purpose of this dissertation was to evaluate visitor attitudes and increase understanding of the potential for managing visitor perceptions, and ultimately visitor behaviors, with educational messaging. This was accomplished by first examining visitor attitudes toward LNT to gain understanding of the cognitive processing which could be applied to improve day-user behaviors and efficacy, thus mitigating resource and social impacts. The next study evaluated attitudes toward ATS to improve understanding of visitor perceptions, which could be applied to user capacity planning and messaging to improve participation in ATS and reduce reliance of personal automobiles in park units. Finally, the third study assessed the ability of theoretically-derived educational messaging to alter visitor perceptions of intrusive anthropogenic noise from military aircraft.

Summary of Findings

LNT Results Summary

The purpose of the study explained in Chapter two was to develop a better understanding of day-user perceptions of LNT to inform the LNT Center and park managers of effective messaging strategies that can mitigate resource and social impacts. This was accomplished by contrasting Rocky Mountain National Park day-user knowledge, awareness and global perceptions, and attitudes toward LNT with those of overnight users at Olympic National Park. Overall results suggested that these user-groups were similar with regard to knowledge, awareness and global perceptions of LNT, and attitudes regarding LNT Principles #2 ("Travel and Camp on Durable Surfaces"), #6

("Respect Wildlife"), and #7 ("Be Considerate of Other Visitors"). Both groups believed LNT to be important and highly effective in minimizing resource impacts and curbing depreciative behaviors, suggesting that future educational strategies will be well received. Principles #2 and #7 require additional educational focus because, to a great extent, both groups misinterpreted underlying actions related to these principles. Principle #4 ("Leave What You Find") may require different messaging approaches for backcountry-overnight visitors because substantially more overnight respondents found "Keeping a single item" to be acceptable than did day-users. However, overall results suggested that backcountry-overnight and day-users could largely be educated about LNT in similar ways.

LNT Implications

The results of this study suggested that future educational strategies aimed at improving LNT efficacy should be well received with both day and overnight visitors, and that education methods can largely be the same for these user-groups. Global perceptions of LNT are positive, and because of this, the LNT Center and park managers should continue using the LNT logo and recommended Principles to increase source credibility. Effective messaging design requires consideration of variables that are thought to enhance and motivate understanding, and should contain elements that promote feelings of personal relevance and responsibility. All LNT messaging should strive to exhibit these features because they are more likely to stimulate central processing, attitude and behavior change.

This study indicated that messaging strategies should focus on targeting day and overnight visitor behaviors related to "Traveling and Camping on Durable Surfaces" and

"Being Considerate of Other Visitors" similarly. Both user-groups indicated having attitudes that largely misalign with recommended practices regarding these Principles, suggesting a need for increased messaging. For example, if a park is experiencing trail-widening in low-lying locations, Principle # 2, "Traveling and Camping on Durable Surfaces," could be provided with an additional contextually-relevant message stating, "Walking around puddles widens trails and damages vegetation." This approach would adhere to previously-effective findings, which have indicated that messages should be reinforced and timely near problematic areas, (Hockett, 2000; Hockett & Hall, 2007; Widman, 2010; Widner & Roggenbuck, 2000). Providing a contextually-specific message in addition to Principle #2, will increase resonance with recipients by repeating what they likely may have seen on trailhead signage (i.e., The Seven LNT Principles). This would also stimulate greater elaboration by providing reasoning and a sense of personal responsibility (i.e., potentially damaging vegetation) for not walking around puddles.

Attitudes towards Principle #4, "Leave What You Find," resulted in substantial differences between the user-groups, as more backcountry-overnight respondents found "Keeping a single item as a souvenir," to be appropriate than did day-users. These results indicated an overall lack of understanding concerning the concepts related to this Principle, but perhaps more so with backcountry-overnight visitors. The LNT Center and park managers should consider employing additional focus to backpackers regarding Principle #4. For example, the LNT Center could work with parks to implement additional messages that complement "Leave What You Find," at the pre-trip planning level through permitting websites, permitting offices and backcountry trailhead locations.

In addition to Principle #4, a potential contextual messaging may state, "Don't you want your children's children to experience this beautiful place, just as you have?" A message of this level would be expected to appeal to visitors by making it easy to process and be relevant, while instilling a sense of responsibility (i.e., focusing on family and timelessness).

ATS Results Summary

The purpose of the study explained in Chapter three, was to advance understanding of potential messaging and management strategies related to ATS, by determining salient visitor attitudes toward ATS experiences in parks. This was accomplished by contrasting visitor attitudes regarding ATS at Yosemite and Rocky Mountain National Park. Results suggested that the concepts of "ease," "freedom," and "stress" and the ten salient underlying variables associated with these factors should be applied to messaging strategies aimed at increasing ridership, improving current ATS visitor experiences, and reducing reliance of personal vehicles. These results also provided greater understanding of potential indicators and standards of quality for ATS visitor-use management frameworks, and indicated that park management should take these variables into consideration when modifying current infrastructure or planning future ATS operations.

ATS Implications

Findings suggested that "ease," "freedom," and "stress" represent topics in which park management may be able to message to visitors in a manner that increases ATS ridership, improves visitor experiences, and decreases the reliance on personal automobiles, ultimately reducing impacts to park resources. Results indicate that

messaging should be implemented and tested in YOSE, RMNP and other units focusing upon the "ease," "freedom," and lack of "stress" associated with taking the shuttle. All potential messages should incorporate the constructs and underlying variables discussed within this study, while also considering factors that motivate understanding, and engender personal relevance and responsibility. There are numerous messages that could be generated assimilating these elements, and several potential examples are included in Table 5.1.

Table 5.1
Potential ATS Messaging Incorporating Variables Pertaining to "Ease," "Freedom," and "Stress"

"Avoid traffic stress ---- park here and let our free buses take you to the scenic overlooks"
"Let our buses safely guide you around the park"
"Avoid parking-lot crowds by taking the easy, safe park shuttle"
"Enjoy the freedom of not having to drive ---- Take our easy shuttles"
"It's easy to find your way around the park when our trained shuttle drivers safely transport you to the scenic sites"
"Enjoy the scenic sites of the park on a pleasant, safe shuttle"
"Experience the freedom of accessing the park while escaping the driving and parking stress ---- Take the park shuttle"

The salient attitudinal variables discovered with this study demonstrate the importance of messaging to visitors in a manner than emphasizes the problems associated with driving personal vehicles. If drivers are not aware of personal vehicle impacts (i.e., impacts to natural resources and social experiences), they will likely not be as enticed to participate in ATS (Cullinane & Cullinane, 1999). These can be emphasized by pairing messages with additional statements demonstrating the positive effects of using ATS, such as improved air quality, noise reduction, and greater wildlife presence (Laube & Stout, 2000; Turnbull, 2003). Implementation of the LNT Principles at shuttle hubs and on shuttle buses should also be considered, as this will reinforce overall resource protection, while encouraging pleasant interactions with other visitors. While multiple

dissemination strategies should be implemented (i.e., signage inside and outside the park, within buses, websites, surrounding community businesses), ITS may be the most beneficial strategy because of its versatility and proven usefulness within other park units (Daigle & Zimmerman, 2004a; 2004b; Dilworth & Shafer, 2004; Zimmerman et al., 2003). Managers should strive to provide messages early in the visitors' planning process so that expectations and preparations can be made to align with ATS structures.

The results of this study also informed park management concerning potential indicators and standards of quality, and planning efforts pertaining to ATS. Use of the ATS Report Card (Figure 3.5) is encouraged to establish baseline data and allow for subsequent evaluations of ATS operations. Park planners should also consider aspects of "ease," "freedom," and "stress" with current infrastructure and future developments. Results suggested that conforming infrastructure around these concepts may increase acceptance and participation in ATS in other units. That is, if visitors perceive ATS as a viable, easy, and safe mode of travel within one unit, they are likely to participate in ATS in another unit if it provides for a similar experience. All developments should consider these constructs and the associated underlying variables, and examine techniques to avoid crowding on buses, while not creating long queues and wait times that would deter ridership participation (Holly et al., 2010). Planners must consider ATS messaging and infrastructure systematically, as a visitor's choice to participate in ATS may have unintended consequences such as crowding on trail segments, and ensuing resource and social impacts (Lawson, et al., 2011; Pettebone et al., 2011). Messaging should be seen as a viable approach to encourage visitors to go where and when park managers deem

appropriate, to maximize visitor experiences while mitigating resource and social impacts.

Soundscape Messaging Results Summary

The purpose of the study explained in Chapter four was to determine if educational messaging could significantly affect visitor acceptability and normative evaluations of quality pertaining to military aircraft sounds. This was accomplished by formulating and testing a theoretically-derived message, and evaluating its effectiveness with visitors in Sequoia National Park. Results determined that informing visitors about the presence of military aircraft could improve acceptability and alter visitor evaluations of military aircraft sounds by as much as 15%. The educational message provided to "primed" respondents resulted in statistically-significant differences in acceptability compared with respondents that were not informed about the presence of military aircraft. "Unprimed respondents" who did not receive the message, found all soundclips that contained military aircraft to be unacceptable. "Priming" respondents improved acceptance of military aircraft sounds that peaked at 33 dBA and 46 dBA to an acceptable level, which suggested that messaging could alter visitor evaluations of military aircraft at Sequoia.

Soundscape Messaging Implications

The findings of this study indicated that educational messaging might offer immediate benefits to visitor experiences. These significant results do not necessarily suggest that the evaluated message should be implemented in Sequoia, but instead demonstrates the effect messaging can have on visitor perspectives and evaluations of aircraft sounds. These results provide park managers with additional tools to manage

visitor experiences as they pertain to park soundscapes. If park managers deem this approach to be applicable, messaging should be tested using multiple methods of dissemination (e.g., trailhead signage, brochures, interpretive presence) following design features congruent with existing NPS messaging. Messages should be implemented and evaluated through temporary placement, near areas which tend to be most problematic, to determine how they affect visitor behaviors and experiences. Those messages that are found to assist with soundscape protection and improve visitor experiences could be employed more permanently.

Limitations and Future Research

There were several limitations to the studies discussed within this dissertation that merit additional research to support and further validate findings, and to generalize across NPS units. The day-users and overnight visitors sampled for the LNT study completed different types of survey instruments, and each contained slightly different variable phrases to make the behaviors or scenarios applicable for the respective user-groups. If feasible, future studies should apply the same survey design and wording across samples, and should attempt to evaluate all seven LNT Principles. The LNT study measured samples from two separate national parks, but research pertaining to these user-groups should be evaluated within the same park and at other types of protected areas (e.g., city parks, state parks, wildlife refuges, etc.) to evaluate the generalizability of future educational efforts. The example messaging designed from the findings of the LNT study should also be evaluated in Olympic and Rocky Mountain National Parks, as well as other protected areas, to determine if attitude-based LNT messages alter behaviors.

The series testing using multi-group confirmatory factor analyses for the ATS study indicated that the constructs of "ease," "freedom," and "stress" were perceived very similarly at Yosemite and Rocky Mountain National Parks, but not exactly in the same manner at both units. It is recognized that these parks, and each NPS unit across the country offer different visitor experiences, and not all ATS messaging or infrastructure can be the same. Despite the differences in shuttle purpose and associated visitor experiences at Yosemite and Rocky, it is encouraging and significant that the results of this study found such substantial similarities between these parks. But because the full sequence of model testing did not meet the suggested fit for all of the statistical examinations, it is suggested that these variables be evaluated for salience at other park units, and other types of protected areas. We recommend that identical variables be evaluated and confirmatory and multi-group confirmatory factor analysis procedures be replicated using the procedures described within Chapter three. Future ATS research should also evaluate visitor characteristics such as age, family situation, and motivation, because these have been found to affect perceptions of ATS. Experimental implementation of proposed messaging should be evaluated in Yosemite and Rocky, as well as other units to determine if these communication strategies actually increase ATS ridership, improve visitor experiences, and decrease the reliance on personal automobiles.

The soundscape messaging study discussed in Chapter four had limitations that warrant additional research. The military aircraft message was provided only to "primed" respondents through a paper on-site survey, and future research should evaluate the effectiveness of other communication methods (e.g., trailhead signage, brochures, interpretive ranger talk). Perhaps the most challenging aspect of messaging to visitors is

to actually motivate them enough to contemplate a given message. For example, the Miller et al., study demonstrated that only 40% of respondents, who had an opportunity to view the message, remembered seeing it. All future messaging studies should strive to continue examining messaging features, to determine the most effective way to stimulate visitor elaboration. The evaluated soundclips described with this study were played for respondents in descending order, which may have produced an order effect. Despite trends that suggest that visitors were generally less acceptable of louder than quieter military aircraft, soundclip order should be evaluated in future studies. This study only tested soundclip acceptability at Sequoia National Park, but other NPS units that experience predominantly military aircraft overflights should also be evaluated to determine salience. Messaging concerning the presence of other types of aircraft (e.g., commercial or air-tour) should be tested in units that experience those predominate events to determine if educational information has a similar effect on visitor perceptions.

Management Principles

This dissertation demonstrated the strength of social science research to evaluate visitor attitudes and to apply that understanding to create empirically-based messages, which could be applied to alter visitor attitudes, behaviors and perceptions. The findings presented within these studies can be used by the NPS and other protected areas to manage escalating visitor use, and external stressors, such as noise from aircraft overflights, while preserving and protecting resource and social conditions. This dissertation adds to the visitor use management toolbox with four overarching principles discovered through the studies presented here.

- **Managing visitor use, requires that we understand visitors.**

Effectively accommodating visitor use and visitor experiences requires that park managers understand who visitors are, their motivations, and how they perceive aspects of the park experience. Much of this can be accomplished by comprehending visitor attitudes. Understanding visitor attitudes allows managers to better protect park resources and social conditions by altering behaviors and experiences to align with management objectives.

- **Visitor attitudes inform messaging strategies.**

Through this dissertation, we have gained a deeper understanding of day-user attitudes toward LNT and associated behaviors. This comprehension allows the LNT Center and park managers to move forward, largely messaging to day-users in a similar manner as overnight visitors. We have also been able to decipher that there are particular behaviors in which minimum-impact education should be targeting, through implementation of contextually-relevant messaging. Similarly, we now understand visitor attitudes toward ATS, and in doing so, have determined salient topics that can be used to influence travel mode decisions. Finally, our comprehension of visitor attitudes toward aircraft sounds can be used to foster the development of influential messaging that can alter park experiences.

- **Messaging can alter visitor perspectives to align with management objectives.**

Maintaining management objectives while accommodating internal factors such as high visitation, and inevitable external factors such as aircraft overflights, can be a daunting task. Yet managers should feel empowered, knowing that messaging can be used to effectively maximize visitor experiences while mitigating resource and social

impacts. This dissertation has suggested viable messaging strategies, founded in theoretical frameworks and salient visitor attitudes, that are effective in managing visitor use. As author, naturalist, and environmentalist Edward Abbey (1989) once said, "One word is worth a thousand pictures – If it's the right word" (p. 56). As it relates to visitor use, dissemination of management objectives through effective wording can alter visitor attitudes, perceptions, and behaviors, ultimately improving resource and social conditions. Messaging should be seen as an advantageous approach to encourage visitors to conform to recommended behaviors, to go where, when, and how park managers deem appropriate, and to positively influence visitor experiences within a park setting.

- **Messaging can improve the quality of visitor experiences.**

The formulation of messaging based on salient attitudes, allows managers to tailor park experiences to meet visitor needs and expectations. Awareness of attitudes toward ATS allows managers to modify transportation experiences to meet visitor desires, and in doing so, improves the quality of experiences and encourages future ridership. Visitor attitudes toward aircraft noise are generally negative, yet this is an inevitable external feature that will likely continue to impact park visitor experiences. However, this dissertation has shown that implementation of effective educational messaging pertaining to aircraft sounds can affect normative evaluations of quality, and ultimately enhance visitor experiences. This dissertation adds to the visitor-use management toolbox by demonstrating the strength of assessing visitor perspectives, to apply relevant, impactful messaging that can improve visitor experiences and achieve management objectives.

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APPENDIX A

Surveyor Use Only
ID: _____ Date: / / 2009
Time: _____ AM/PM

Colorado State University

1. Please indicate your level of agreement with the following statements using the scale '1' NOT AT ALL UNDER MY CONTROL to '7' COMPLETELY UNDER MY CONTROL. *Circle the number of your response for each statement*.

	Not at all under my control			Neutral			Completely under my control
a. How I act while in Rocky Mountain National Park is…	1	2	3	4	5	6	7
b. The way I act while on the trail in Rocky Mountain National Park is…	1	2	3	4	5	6	7
c. My recreation practices in Rocky Mountain National Park are…	1	2	3	4	5	6	7
d. The way the individuals in my group act while in Rocky Mountain National Park is…	1	2	3	4	5	6	7

2. Please indicate how INAPPROPRIATE or APPROPRIATE you think each of the following activities is for a visitor to do in Rocky Mountain National Park. *Circle the number of your response for each statement*.

Activities	Very Inappropriate			Neutral			Very Appropriate
a. Experience nature by not preparing for all types of weather or hazards before I get on a trail	1	2	3	4	5	6	7
b. Schedule my trip during times of high use to reduce overall impact	1	2	3	4	5	6	7
c. Travel off trail to experience the natural environment	1	2	3	4	5	6	7
d. Walk around muddy spots on the trail	1	2	3	4	5	6	7
e. Use the bathroom in a lake, river or stream if there are no public facilities	1	2	3	4	5	6	7
f. Carry all litter back out, leaving only food scraps behind	1	2	3	4	5	6	7
g. Keep a single item like a rock, plant, stick or feather as a souvenir	1	2	3	4	5	6	7
h. Move rocks and/or logs to make a resting location more comfortable	1	2	3	4	5	6	7
i. Drop food on the ground to provide wildlife a food source	1	2	3	4	5	6	7
j. Approach wildlife to take a photo	1	2	3	4	5	6	7
k. Hike side by side with members of my group on existing trails	1	2	3	4	5	6	7
l. Take a break along the edge of the trail	1	2	3	4	5	6	7

3. Please indicate the level at which you think each of the following activities would reduce negative impacts and improve visitor experiences in the Park. *Circle the number of your response for each statement*.

Participating in the following activities in Rocky Mountain National Park would reduce impact…	Never			Sometimes			Every time
a. Prepare for all types of weather, hazards, or emergencies before I get on a trail	1	2	3	4	5	6	7
b. Schedule trip to avoid times of high use	1	2	3	4	5	6	7
c. Stay on designated or established trails	1	2	3	4	5	6	7
d. Walk single file in the middle of the trail, even when wet or muddy	1	2	3	4	5	6	7
e. Carry out all litter, even crumbs, peels, or cores	1	2	3	4	5	6	7
f. Never remove objects from the area, not even a small item like a rock, plant, stick, or feather	1	2	3	4	5	6	7
g. Never approach, feed, or follow wildlife	1	2	3	4	5	6	7
h. Take breaks away from the trail and other visitors	1	2	3	4	5	6	7

4. The same activities are listed below. Regardless of how effective you think each of the following activities are, please indicate how DIFFICULT you think each of the following activities would be for a visitor to do in Rocky Mountain National Park. *Circle the number of your response for each statement*.

Activities	Not at all Difficult			Moderately Difficult			Extremely Difficult
a. Prepare for all types of weather, hazards, or emergencies before I get on a trail	1	2	3	4	5	6	7
b. Schedule trip to avoid times of high use	1	2	3	4	5	6	7
c. Stay on designated or established trails	1	2	3	4	5	6	7
d. Walk single file in the middle of the trail, even when wet or muddy	1	2	3	4	5	6	7
e. Carry out all litter, even crumbs, peels, or cores	1	2	3	4	5	6	7
f. Never remove objects from the area, not even a small item like a rock, plant, stick, or feather	1	2	3	4	5	6	7
g. Never approach, feed, or follow wildlife	1	2	3	4	5	6	7
h. Take breaks away from the trail and other visitors	1	2	3	4	5	6	7

5. The same activities are listed below. In COLUMN A tell us if you DO each activity by *circling* NEVER, SOMETIMES or ALWAYS.
In COLUMN B, please indicate how LIKELY are you to do the activity in the future by *circling the number of your response for each statement.*

Column A				Column B How Likely Are You To Do This In The Future?						
Activities	**Do You Do This Now?**			**Not at all Likely**			**Moderately Likely**			**Extremely Likely**
a. Prepare for all types of weather, hazards, or emergencies before I get on a trail	Never	Sometimes	Always	1	2	3	4	5	6	7
b. Schedule trip to avoid times of high use	Never	Sometimes	Always	1	2	3	4	5	6	7
c. Stay on designated or established trails	Never	Sometimes	Always	1	2	3	4	5	6	7

Activities	Do You Do This Now?			Not at all Likely			Moderately Likely			Extremely Likely
d. Walk single file in the middle of the trail, even when wet or muddy	Never	Sometimes	Always	1	2	3	4	5	6	7
e. Carry out all litter, even crumbs, peels, or cores	Never	Sometimes	Always	1	2	3	4	5	6	7
f. Never remove objects from the area, not even a small item like a rock, plant, stick, or feather	Never	Sometimes	Always	1	2	3	4	5	6	7
g. Never approach, feed, or follow wildlife	Never	Sometimes	Always	1	2	3	4	5	6	7
h. Take breaks away from the trail and other visitors	Never	Sometimes	Always	1	2	3	4	5	6	7

6. How FAMILIAR are you with the Leave No Trace Center for Outdoor Ethics? *Please circle only one number*.

Not at all Familiar	Slightly Familiar	Moderately Familiar	Quite Familiar	Extremely Familiar
0	1 2	3	4 5	6

7. How would you describe your current knowledge of "Leave No Trace" practices? *Please circle only one number*.

No Knowledge	Very Limited	Limited	Average	Above Average	Extensive	Expert
0	1	2	3	4	5	6

8. Please indicate how strongly you AGREE or DISAGREE with the following statements. *Circle the number of your response for each statement*.

Activities	Strongly Disagree			Neutral			Strongly Agree
a. Sometimes it is too difficult to practice "Leave No Trace."	1	2	3	4	5	6	7
b. Practicing "Leave No Trace" takes too much time.	1	2	3	4	5	6	7
c. Practicing "Leave No Trace" violates the rights of an individual to do as they please in the outdoors.	1	2	3	4	5	6	7
d. Practicing "Leave No Trace" does not reduce the environmental harm caused by travel in the Park.	1	2	3	4	5	6	7
e. Practicing "Leave No Trace" effectively protects the environment so that future generations may enjoy it.	1	2	3	4	5	6	7
f. Practicing "Leave No Trace" enhances my outdoor experience.	1	2	3	4	5	6	7
g. It is important that all visitors practice "Leave No Trace."	1	2	3	4	5	6	7
h. It is important that Park regulations require all visitors to practice "Leave No Trace."	1	2	3	4	5	6	7
i. The people I recreate with believe it is important to practice "Leave No Trace."	1	2	3	4	5	6	7
j. In general, the opinions of others have little effect on my practicing "Leave No Trace."	1	2	3	4	5	6	7

Activities	Strongly Disagree			Neutral			Strongly Agree
k. I practice "Leave No Trace" because the people I recreate with believe it is important.	1	2	3	4	5	6	7
l. I practice "Leave No Trace" because the Park regulations state that I should do so.	1	2	3	4	5	6	7
m. It is important to practice "Leave No Trace" techniques when in the Park.	1	2	3	4	5	6	7
n. If I learned my actions in the Park damaged the environment, I would change my behavior.	1	2	3	4	5	6	7
o. I get upset when I see other individuals in the Park not following "Leave No Trace" practices.	1	2	3	4	5	6	7
p. I insist that "Leave No Trace" practices are followed by all members of my group.	1	2	3	4	5	6	7

9. How FREQUENTLY in the past 3 months, did you do any of the following activities related to "Leave No Trace?"
***Circle the number of your response for each statement*.**

Activities	Not at All			Often			Very Frequently
a. Talk with others	1	2	3	4	5	6	7
b. Read articles and books	1	2	3	4	5	6	7
c. Take courses or attend meetings	1	2	3	4	5	6	7
d. Teach others	1	2	3	4	5	6	7
e. View websites ("Leave No Trace," Facebook, YouTube or Twitter)	1	2	3	4	5	6	7

Other (Please specify): _____

10. Where did you first learn about "Leave No Trace?" ***Please check only one answer.***

Leave No Trace website | Information kiosk/ Park literature | Popular media (magazines, books)
Course or seminar | Park personnel/Interpretive talk | Other (Please specify):_____

11. What is your gender? Male Female

12. In what year were you born? _____

13. Do you live in the United States?

Yes – What is your zip code? _____
No – In what country do you live? _____

14. What is the highest level of education you have completed?

Some high school | High school graduate or GED | Some college, business, or trade school
College, business, or trade school graduate | Some graduate school | Master's, doctoral, or professional degree

15. What is your race? (Check one or more)

American Indian or Alaskan Native | Asian | Black or African American
Native Hawaiian or Pacific Islander | White or Caucasian

Thank you for participating in this survey. Your input is very important to Colorado State University and Rocky Mountain National Park.

APPENDIX B

Surveyor Use Only
ID: 1_____
Date: / / 2008
Time:_____ AM/PM

OMB # 1024-0224 (NPS # 08-028)
Expiration Date: 12/31/2008
IRB ID# 08-107H

Rocky Mountain National Park

Alberta Falls Survey

1. **Including this visit, approximately how many times have you visited Rocky Mountain National Park?**

Number of visits: _____

2. **On the scale below, please indicate how familiar you are with Rocky Mountain National Park ? (Circle one number.)**

1	2	3	4	5	6	7	8	9
Not at all familiar								**Extremely familiar**

3. **Have you visited Alberta Falls before? (Check one.)**

Yes (CONTINUE TO QUESTION 4)
No (SKIP TO QUESTION 5)

4. **Including this time, approximately how many times have you visited Alberta Falls?**

Number of visits:_____

5. On your trip today, at which trailhead did you begin your hike? (Check one.)

Glacier Gorge Trailhead
Bear Lake Trailhead
Don't know
Other: _____

6. On your hike today, which locations did you visit? (Check all that apply.)

Alberta Falls
Mills Lake
Black Lake
Loch Vale
Sky Pond
Dream Lake
Emerald Lake
Nymph Lake
None of the above
Don't know
Other:_____

7. Approximately what time did you start your hike to Alberta Falls today?

_____AM/PM

OR

Don't know

8. In general, how did the encounters you had with other people at Alberta Falls today affect your overall enjoyment of your hiking experience? (Please check one response, even if you did not see other people.)

□ Greatly added to my enjoyment
□ Somewhat added to my enjoyment
□ Had no effect
□ Somewhat reduced my enjoyment
□ Greatly reduced my enjoyment

9. A **We would like to know how many other people you think you could encounter at Alberta Falls without feeling too crowded. To help judge this, please rate each of the photographs by indicating how acceptable you find it based on the number of people in the photo. (Circle <u>one</u> number for <u>each photo</u>)**

	Very Unacceptable								**Very Acceptable**
Photo 1	-4	-3	-2	-1	0	1	2	3	4
Photo 2	-4	-3	-2	-1	0	1	2	3	4
Photo 3	-4	-3	-2	-1	0	1	2	3	4
Photo 4	-4	-3	-2	-1	0	1	2	3	4
Photo 5	-4	-3	-2	-1	0	1	2	3	4

B **Which photograph looks most like the number of people you saw at Alberta Falls today?**

□ Photo 1
□ Photo 2
□ Photo 3
□ Photo 4
□ Photo 5

C **Which photograph looks most like the number of people you would <u>prefer</u> to see at Alberta Falls?**

□ Photo 1
□ Photo 2
□ Photo 3
□ Photo 4
□ Photo 5

10. **How crowded did you feel while you were at Alberta Falls today? (Circle one number.)**

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Not at all Crowded		**Slightly Crowded**			**Moderately Crowded**		**Extremely Crowded**	

11. How much of a problem were each of the following items for you at Alberta Falls today? (Check one box for each item.)

	Not a Problem	Small Problem	Big Problem	Don't Know/No Opinion
Difficulty locating the trailhead				
Lack of available parking at the trailhead				
Not enough information provided at the trailhead about how to prepare for a hike on the trail				
Not enough signs with information about the natural and cultural history of the area				
Not enough directional signs along the trail				
Trails are too wide				
Trails are too eroded (e.g. exposed roots, rocks, channeling)				
Litter along the trail				
Improperly disposed human waste evident on or near the trail				
Too many people on the trail				
Off-trail trampling around Alberta Falls				
Sound from aircraft				
Sound from large groups of visitors				
Sound from other visitors				
Sound from NPS maintenance				
Sound from vehicles (e.g. cars, buses, motorcycles)				
Other: _____				

12. What did you like <u>best</u> about your trip to Alberta Falls today?

Response:

13 What did you like <u>least</u> about your trip to Alberta Falls today?

Response:

14. **We would like to know how you feel about using different kinds of transportation in Rocky Mountain National Park. For each statement below:**

1. Rate how much you agree or disagree that the statement describes traveling in Rocky Mountain National Park in your *personal vehicle*
then
2. Rate how much you agree or disagree that the statement describes traveling using the Rocky Mountain National Park *shuttle bus.* Please answer this part even if you have not yet used the shuttle bus system.

Statements	Your Personal Vehicle 1= Strongly Agree 2= Agree 3= Disagree 4= Strongly Disagree				Park Shuttle 1= Strongly Agree 2= Agree 3= Disagree 4= Strongly Disagree			
You have easy access to your personal belongings (such as recreation equipment)	1	2	3	4	1	2	3	4
You have an opportunity to learn about the park while traveling	1	2	3	4	1	2	3	4
Travel is affordable or low cost	1	2	3	4	1	2	3	4
You have opportunities to see wildlife	1	2	3	4	1	2	3	4
It is easy to find your way around the park	1	2	3	4	1	2	3	4
You have pleasant interactions with other visitors	1	2	3	4	1	2	3	4
It takes too long to get where you want to go	1	2	3	4	1	2	3	4
You feel safe	1	2	3	4	1	2	3	4
You have little impact on park's natural environment	1	2	3	4	1	2	3	4
You connect with the natural environment	1	2	3	4	1	2	3	4
You hear natural sounds	1	2	3	4	1	2	3	4
You have easy access to different areas of the park	1	2	3	4	1	2	3	4
You hear the sounds of traffic	1	2	3	4	1	2	3	4
It is easy to get to scenic overlooks/vistas	1	2	3	4	1	2	3	4
You experience a sense of freedom	1	2	3	4	1	2	3	4
You feel stressed while traveling through the park	1	2	3	4	1	2	3	4
You have trouble finding parking	1	2	3	4	1	2	3	4
You can go "where you want, when you want"	1	2	3	4	1	2	3	4
You experience conflict with visitors using other kinds of transportation	1	2	3	4	1	2	3	4
You avoid traffic congestion	1	2	3	4	1	2	3	4
You feel crowded by other visitors	1	2	3	4	1	2	3	4

15. How did you get to the trailhead today?

Personal vehicle
Shuttle bus Other: _____

16. What is your sex? (Check one.)

Male
Female

17. In what year were you born?

Year born: 19____

18. Do you live in the United States? (Check one.)

Yes - What is your zip code? _____
No - In what country do you live? _____

19. What is the highest level of formal education you have completed (Check one.)

Some high school
High school graduate or GED
Some college, business or trade school
College, business or trade school graduate
Some graduate school
Master's, doctoral or professional degree

20. Are you Hispanic or Latino? (Check one)

Yes
No

21. What is your race? (Check one or more.)

American Indian or Alaska Native
Asian
Black or African American
Native Hawaiian or other Pacific Islander
White

Thank you for your help with this survey!
Please return the completed questionnaire to the survey administrator.

PRIVACY ACT and PAPERWORK REDUCTION ACT statement: 16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by park managers to better serve the public. Response to this request is voluntary. No action may be taken against you for refusing to supply the information requested. The permanent data will be anonymous. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. BURDEN ESTIMATE statement: Public reporting burden for this form is estimated to average 10 minutes per response. Direct comments regarding the burden estimate or any other aspect of this form to:

Superintendent
Rocky Mountain National Park
Estes Park, CO 80538

OMB # 1024-0224 (NPS # 08-028) Expiration Date: 12/31/2008

APPENDIX C

D

Please imagine yourself as a visitor to Rocky Mountain National Park. If you were to hear and/or see aircraft flying overhead during your visit, to what extent would it affect your experience?
It would make my experience…

Very Unacceptable								Very Acceptable
-4	-3	-2	-1	0	1	2	3	4

……..

The following 3 messages are intended to provide Park visitors with information about potential reasons for hearing and/or seeing aircraft while in the Park. Please read the following messages and answer the questions that follow.

Commercial aircraft flying to and from major cities in Colorado are allowed to fly over Rocky Mountain National Park. Consequently, visitors hiking in this area of the park can sometimes hear and/or see high-altitude commercial jets flying overhead.

Would receiving the above message make hearing and/or seeing aircraft more or less acceptable to you?

Less Acceptable				No Effect				More Acceptable
-4	-3	-2	-1	0	1	2	3	4

How does this statement make you feel about your experience in the Park?

_____

Many people use commercial aircraft to fly to and from major cities. Because of the proximity to Denver, Colorado, commercial aircraft are allowed to fly over Rocky Mountain National Park. Consequently, visitors hiking in this area of the park can sometimes hear and/or see high-altitude commercial aircraft overhead.

Would receiving the above message make hearing and/or seeing aircraft more or less acceptable to you?

Less Acceptable				No Effect				More Acceptable
-4	-3	-2	-1	0	1	2	3	4

How does this statement make you feel about your experience in the Park?

_____

Visitors hiking in this area of the park can sometimes hear and/or see high-altitude commercial jets flying overhead because they are allowed to fly over Rocky Mountain National Park.

Would receiving the above message make hearing and/or seeing aircraft more or less acceptable to you?

Less Acceptable				No Effect				More Acceptable
-4	-3	-2	-1	0	1	2	3	4

How does this statement make you feel about your experience in the Park?

_____

Please turn and complete page 2…

Now, please imagine yourself as a visitor to Sequoia National Park. If you were to hear and/or see aircraft flying overhead during your visit, to what extent would it affect your experience?
It would make my experience…

Very Unacceptable								Very Acceptable
-4	-3	-2	-1	0	1	2	3	4

……..

The following 3 messages are intended to provide Park visitors with information about potential reasons for hearing and/or seeing aircraft while in the Park. Please read the following messages and answer the question that follows.

Military aircraft are allowed to conduct training flights over Sequoia National Park. Consequently, visitors hiking in this area of the park can sometimes hear military aircraft flying overhead.

Would receiving the above message make hearing and/or seeing aircraft more or less acceptable to you?

Less Acceptable				No Effect				More Acceptable
-4	-3	-2	-1	0	1	2	3	4

How does this statement make you feel about your experience in the Park?

_____

Visitors hiking in this area of the park can sometimes hear/and or see military aircraft overhead because they are allowed to fly over Sequoia National Park.

Would receiving the above message make hearing and/or seeing aircraft more or less acceptable to you?

Less Acceptable				No Effect				More Acceptable
-4	-3	-2	-1	0	1	2	3	4

How does this statement make you feel about your experience in the Park?

_____

Military aircraft are allowed to conduct training flights over Sequoia National Park in an effort to help keep the United States of America safe. Consequently, visitors hiking in this area of the park can sometimes hear/and or see military aircraft flying overhead.

Would receiving the above message make hearing and/or seeing aircraft more or less acceptable to you?

Less Acceptable				No Effect				More Acceptable
-4	-3	-2	-1	0	1	2	3	4

How does this statement make you feel about your experience in the Park?

_____

Thank you for your participation in this study!!!

APPENDIX D

ID: _____ Location: _____

Date: ____/____/2011 Time: _____AM / PM

Sequoia and Kings Canyon National Parks Visitor Survey

1. How many people are in your personal group (family/friends) today?

Group size: _____

2. Is your personal group part of a commercial tour in the park today? (Check one.)

☐ Yes
☐ No

3. Have you ever visited Sequoia or Kings Canyon National Parks before? (Check one.)

☐ Yes (CONTINUE TO QUESTION 4)
☐ No (SKIP TO QUESTION 5)

4. Approximately how many times have you visited Sequoia or Kings Canyon National Parks before today? (Record a number or check the box.)

Approximate number of visits: _____ **OR** ☐ Don't know/Not sure

5. Please rate the importance of each of the following reasons for your visit to Sequoia or Kings Canyon National Parks today. (Check one box for each item.)

	Not important at all	Slightly important	Moderately important	Very important	Extremely important
Appreciate the scenic beauty.	☐	☐	☐	☐	☐
Experience solitude.	☐	☐	☐	☐	☐
Spend time with family/friends.	☐	☐	☐	☐	☐
Get some exercise.	☐	☐	☐	☐	☐
Experience the sounds of nature.	☐	☐	☐	☐	☐
Experience a sense of connection with nature.	☐	☐	☐	☐	☐
Enjoy peace and quiet.	☐	☐	☐	☐	☐

6. Please indicate how your experience of each of the following items during your visit compared with your expectations. (Check one box for each item.)

	How did it compare with your expectations?					
	I had no expectations	A lot less than expected	Less than expected	About as expected	More than expected	A lot more than expected
Number of people you saw while hiking.	☐	☐	☐	☐	☐	☐
Opportunity to experience sounds of nature.	☐	☐	☐	☐	☐	☐
Opportunity to view wildlife.	☐	☐	☐	☐	☐	☐
Amount of time you heard aircraft.	☐	☐	☐	☐	☐	☐

FOR THE NEXT SET OF QUESTIONS, PLEASE ASK THE SURVEY ATTENDANT FOR ASSISTANCE.

7. ***Military aircraft are allowed to conduct training flights over Sequoia National Park in an effort to help keep the United States of America safe. Consequently, visitors hiking in this area of the park can sometimes hear/and or see military aircraft flying overhead.*** **We would like to know how acceptable you think it is to hear sounds from military aircraft while hiking in this area of the park. To help judge this, we would like you to listen to several short recordings of sounds in Sequoia and Kings Canyon National Parks. Please rate each recording by indicating how acceptable you would find the sounds heard in the audio clip while hiking in this area of the park. (Circle <u>one</u> number for each recording.)**

Very Unacceptable			**Recording 1**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

ADVANCE YOUR PLAYER AND RESUME YOUR LISTENING SESSION.

Very Unacceptable			**Recording 2**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

ADVANCE YOUR PLAYER AND RESUME YOUR LISTENING SESSION.

Very Unacceptable			**Recording 3**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

ADVANCE YOUR PLAYER AND RESUME YOUR LISTENING SESSION.

Very Unacceptable			**Recording 4**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

ADVANCE YOUR PLAYER AND RESUME YOUR LISTENING SESSION.

Very Unacceptable			**Recording 5**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

YOU HAVE COMPLETED THIS PORTION OF YOUR LISTENING SESSION.
CONTINUE TO THE NEXT PAGE

8. Which of the five recordings you just heard sounds most like what you heard at Sequoia or Kings Canyon National Parks today? (Check one.)

☐ Recording 1
☐ Recording 2
☐ Recording 3
☐ Recording 4
☐ Recording 5

9a. Please describe the sounds in the recordings that you found to be pleasing or annoying.

Pleasing sounds: _____

Annoying sounds: _____

9b. Please describe the sounds in the recordings that you found to be appropriate or inappropriate for this area.

Appropriate sounds: _____

Inappropriate sounds: _____

10. Humans can cause noise in national parks in several ways. Please rate the degree to which you think the following types of human-caused noises were a problem during your visit in this area of Sequoia and Kings Canyon National Park. (Check one box for each item.)

	Problem during your hike today?		
Noise from…	**No Problem**	**Small Problem**	**Big Problem**
Automobile traffic	☐	☐	☐
Park operations (e.g., trail maintenance, construction vehicles)	☐	☐	☐
Visitors talking loudly	☐	☐	☐
Aircraft flying overhead	☐	☐	☐
Personal electronics (e.g., cell phone, IPod)	☐	☐	☐

11. Please indicate the extent to which you would support or oppose each of the following potential management actions at Sequoia National Park (Check one box for each item.)

	Strongly Support	Support	Neither Support nor Oppose	Strongly Oppose	Don't Know/Not Sure
Reduce the number of military aircraft allowed to fly over the park.	☐	☐	☐	☐	☐
Maintain the number of military aircraft allowed to fly over the park at the current level.	☐	☐	☐	☐	☐
Increase the number of military aircraft allowed to fly over the park.	☐	☐	☐	☐	☐
Require military aircraft to be flown over the park only during designated dates and times.	☐	☐	☐	☐	☐
Require military aircraft to use designated flight paths over limited areas of the park.	☐	☐	☐	☐	☐
Prohibit military aircraft from flying over the park.	☐	☐	☐	☐	☐

12. What is your gender? (Check one.)

☐ Male
☐ Female

13. In what year were you born?

Year born:_____

14. Do you live in the United States? (Check one.)

☐ Yes (What is your zip code? _____)
☐ No (What country do you live in? _____)

15. What is the highest level of formal education you have completed? (Check one.)

☐ Some high school
☐ High school graduate or GED
☐ Some college, business or trade school
☐ College, business or trade school graduate
☐ Some graduate school
☐ Master's, doctoral or professional degree

16. Are you Hispanic or Latino? (Check one.)

☐ Yes ☐ No

17. What is your race? (Check all that apply.)

☐ American Indian or Alaska Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian
☐ Pacific Islander other than Native Hawaiian
☐ White

Sequoia and Kings Canyon and Colorado State University thank you for your help!
Please return the completed questionnaire to the survey administrator.

PRIVACY ACT and PAPERWORK REDUCTION ACT statement: 16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by park managers to better serve the public. Response to this request is voluntary. No action may be taken against you for refusing to supply the information requested. The permanent data will be anonymous. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. OMB #: 1024-0024 exp. Date: 06/30/2012

BURDEN ESTIMATE statement: Public reporting burden for this form is estimated to average 15 minutes per response. Direct comments regarding the burden estimate or any other aspect of this form to:

Koren R. Nydick, Science Coordinator/Ecologist, Sequoia and Kings Canyon National Parks
47050 Generals Highway, Three Rivers, CA 93271
Koren_Nydick@nps.gov

APPENDIX E

ID: _____ Location: _____

Date: ____/____/2011 Time: _____AM / PM

Sequoia and Kings Canyon National Parks Visitor Survey

1. How many people are in your personal group (family/friends) today?

Group size: _____

2. Is your personal group part of a commercial tour in the park today? (Check one.)

☐ Yes
☐ No

3. Have you ever visited Sequoia or Kings Canyon National Parks before? (Check one.)

☐ Yes (CONTINUE TO QUESTION 4)
☐ No (SKIP TO QUESTION 5)

4. Approximately how many times have you visited Sequoia or Kings Canyon National Parks before today? (Record a number or check the box.)

Approximate number of visits: _____ **OR** ☐ Don't know/Not sure

5. Please rate the importance of each of the following reasons for your visit to Sequoia or Kings Canyon National Parks today. (Check one box for each item.)

	Not important at all	Slightly important	Moderately important	Very important	Extremely important
Appreciate the scenic beauty.	☐	☐	☐	☐	☐
Experience solitude.	☐	☐	☐	☐	☐
Spend time with family/friends.	☐	☐	☐	☐	☐
Get some exercise.	☐	☐	☐	☐	☐
Experience the sounds of nature.	☐	☐	☐	☐	☐
Experience a sense of connection with nature.	☐	☐	☐	☐	☐
Enjoy peace and quiet.	☐	☐	☐	☐	☐

6. Please indicate how your experience of each of the following items during your visit compared with your expectations. (Check one box for each item.)

	How did it compare with your expectations?					
	I had no expectations	A lot less than expected	Less than expected	About as expected	More than expected	A lot more than expected
Number of people you saw while hiking.	☐	☐	☐	☐	☐	☐
Opportunity to experience sounds of nature.	☐	☐	☐	☐	☐	☐
Opportunity to view wildlife.	☐	☐	☐	☐	☐	☐
Amount of time you heard aircraft.	☐	☐	☐	☐	☐	☐

FOR THE NEXT SET OF QUESTIONS, PLEASE ASK THE SURVEY ATTENDANT FOR ASSISTANCE.

7. **We would like to know how acceptable you think it is to hear the following sounds while hiking in this area of the park. To help judge this, we would like you to listen to several short recordings of sounds in Sequoia and Kings Canyon National Parks. Please rate each recording by indicating how acceptable you would find the sounds heard in the audio clip while hiking in this area of the park. (Circle <u>one</u> number for each recording.)**

Very Unacceptable			**Recording 1**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

ADVANCE YOUR PLAYER AND RESUME YOUR LISTENING SESSION.

Very Unacceptable			**Recording 2**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

ADVANCE YOUR PLAYER AND RESUME YOUR LISTENING SESSION.

Very Unacceptable			**Recording 3**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

ADVANCE YOUR PLAYER AND RESUME YOUR LISTENING SESSION.

Very Unacceptable			**Recording 4**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

ADVANCE YOUR PLAYER AND RESUME YOUR LISTENING SESSION.

Very Unacceptable			**Recording 5**					Very Acceptable
-4	-3	-2	-1	0	+1	+2	+3	+4

YOU HAVE COMPLETED THIS PORTION OF YOUR LISTENING SESSION.
CONTINUE TO THE NEXT PAGE

8. Which of the five recordings you just heard sounds most like what you heard at Sequoia or Kings Canyon National Parks today? (Check one.)

☐ Recording 1
☐ Recording 2
☐ Recording 3
☐ Recording 4
☐ Recording 5

9a. Please describe the sounds in the recordings that you found to be pleasing or annoying.

Pleasing sounds: _____

Annoying sounds: _____

9b. Please describe the sounds in the recordings that you found to be appropriate or inappropriate for this area.

Appropriate sounds: _____

Inappropriate sounds: _____

10. Humans can cause noise in national parks in several ways. Please rate the degree to which you think the following types of human-caused noises were a problem during your visit in this area of Sequoia and Kings Canyon National Park. (Check one box for each item.)

	Problem during your hike today?		
Noise from…	**No Problem**	**Small Problem**	**Big Problem**
Automobile traffic	☐	☐	☐
Park operations (e.g., trail maintenance, construction vehicles)	☐	☐	☐
Visitors talking loudly	☐	☐	☐
Aircraft flying overhead	☐	☐	☐
Personal electronics (e.g., cell phone, IPod)	☐	☐	☐

11. Please indicate the extent to which you would support or oppose each of the following potential management actions at Sequoia National Park (Check one box for each item.)

	Strongly Support	Support	Neither Support nor Oppose	Strongly Oppose	Don't Know/Not Sure
Reduce the number of military aircraft allowed to fly over the park.	☐	☐	☐	☐	☐
Maintain the number of military aircraft allowed to fly over the park at the current level.	☐	☐	☐	☐	☐
Increase the number of military aircraft allowed to fly over the park.	☐	☐	☐	☐	☐
Require military aircraft to be flown over the park only during designated dates and times.	☐	☐	☐	☐	☐
Require military aircraft to use designated flight paths over limited areas of the park.	☐	☐	☐	☐	☐
Prohibit military aircraft from flying over the park.	☐	☐	☐	☐	☐

12. What is your gender? (Check one.)

☐ Male
☐ Female

13. In what year were you born?

Year born:_____

14. Do you live in the United States? (Check one.)

☐ Yes (What is your zip code? _____)
☐ No (What country do you live in? _____)

15. What is the highest level of formal education you have completed? (Check one.)

☐ Some high school
☐ High school graduate or GED
☐ Some college, business or trade school
☐ College, business or trade school graduate
☐ Some graduate school
☐ Master's, doctoral or professional degree

16. Are you Hispanic or Latino? (Check one.)

☐ Yes ☐ No

17. What is your race? (Check all that apply.)

☐ American Indian or Alaska Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian
☐ Pacific Islander other than Native Hawaiian
☐ White

Sequoia and Kings Canyon and Colorado State University thank you for your help!
Please return the completed questionnaire to the survey administrator.

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Koren R. Nydick, Science Coordinator/Ecologist, Sequoia and Kings Canyon National Parks
47050 Generals Highway, Three Rivers, CA 93271
Koren_Nydick@nps.gov