Exploring the Structure and Development of Management Prescriptions for Public Lands

by,
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Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Forestry

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September 12, 2003
Blacksburg, Virginia

Keywords: public lands planning, National Park Service planning, visitor capacity, carrying capacity, management prescriptions, desired conditions, stated choice studies

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ABSTRACT

Management prescriptions that describe desired conditions for resources and visitor experiences have become widely accepted as an important component of public land management plans. However, very little effort is spent on evaluating and learning about this part of the planning process.

This research identifies and addresses the need to explore opportunities for additional guidance on the development of management prescriptions, by (1) evaluating the current perception of the purpose of management prescriptions; (2) developing criteria and other tools to guide the development of management prescriptions based on the experiences of public land management professionals; and (3) testing an alternative method for collecting visitor preference data regarding social, resource and management conditions to inform development of management prescriptions.

The first two papers report the results of a visitor preference study, using the stated choice method, conducted in Acadia National Park. The purpose of the first paper is to identify visitor preferences for tradeoffs among social, resource and related management conditions of the recreation setting. The purpose of the second paper is to identify differences among visitor preferences for social, resource and management conditions in various recreation settings. By considering the integrative nature of these attributes and the relative importance to visitors across recreation settings, the definition of management prescriptions can be better informed. To further investigate the results of the stated choice method and ensure the validity of the data, a verbal protocol assessment was applied to a sample of the stated choice survey respondents.

The purpose of the third paper is to reexamine the role of management prescriptions for park management planning and investigate tools for facilitating development of management prescriptions. The study included in-depth interviews, participant observation of a three-day

planning workshop and a written survey. All of the participants in the various components of the study were National Park Service land management professionals. The study resulted in a list of the purpose and criteria for management prescriptions and a related menu of desired condition topics, which will be integrated into planning guidance to aid the development of unique and effective management prescriptions for national parks.

ACKNOWLEDGEMENTS

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CHAPTER I. INTRODUCTION

Dissertation Concepts and Themes

The advent of the automobile and the end of World War II marked the beginning of a dramatic expansion in outdoor recreation in the United States. As outdoor recreation trend studies have documented over time, people have been increasingly visiting and traveling deeper into public lands to enjoy the serenity and natural beauty of these places. Historically, our attitude toward recreation was originally one of exploitation, where the primary concern was access rather than managing for sustainability (Wagar, 1964). The recreation management approach focused on developing facilities to accommodate increased use. Although the concept of unlimited access to public lands still exists, it is increasingly recognized by public land managers that altering recreation areas to accommodate more use alters the characteristics of those places and visitor experiences.

Due to the challenge to protect resources and provide high quality recreation experiences, while managing a growing number of outdoor recreationists, the concept of carrying capacity became popular in the field of recreation management. Establishing a carrying capacity was seen as the answer to visitor management concerns such as reducing recreation crowding, conflicts and resource impacts. Carrying capacity, or visitor capacity, has been defined as that character of use that can be supported over some time period without causing adverse impacts to the environment or visitor experiences (Lime & Stankey, 1971). Although the concept seems relatively straightforward, the implementation of carrying capacity decision making for visitor management on public lands has been a complex and troublesome concept that has challenged planners and administrators for some time (Lime, 1979). Managers and planners have been reluctant to acknowledge overuse or inappropriate use of an area because there has been a lack of rationale and support to make such conclusions (Manning, McCool & Graefe, 1995).

Extensive research and management experience over the last thirty years have revealed significant problems and deficiencies with application of the carrying capacity model to recreation management issues. The key concern was that it framed the problem of managing recreation in relation to managing levels of use. Restricting visitor use is a poor method of managing resource impacts because in most situations a little use causes considerable impact and further increases in use levels have less and less additional effect on the natural environment

(Cole, 1987; Leung & Marion, 2000; Newsome, Moore & Dowling, 2002; Wight, 1998). All recreation use causes some changes in the natural environment, so impacts from recreation use only become damage when there is some judgment about what conditions ought to be in a particular area – it is a value judgment that must be defined by land managers and the public (Wagar, 1974; Wight,1998). Managing recreation use is a socio-political process that involves choices about values and how those values will be distributed across the landscape and among users (Stankey, 1997). It is a social rather than technical problem, so the focus of new decision-making models has shifted to what is most important: defining desired resource conditions and visitor experiences.

My research builds on the concept that articulating desired conditions for an area is the most critical component to public land management, demonstrating a key advance in the concept of visitor management. However, the articulation of desired conditions is still an area in need of critical analysis and further guidance. It has been suggested that statements of desired conditions that are vague and ambiguous (e.g., protect resources) are insufficient for management purposes or addressing legal visitor capacity requirements (Cole and Stankey, 1997; Haas, 2001). The intent of my research is to develop guidance to help managers, planning staffs and the public find ways to be specific and explicit in defining intended desired resource and social conditions and related management conditions for protected areas. Further, this research acknowledges that identification and definition of desired conditions is a social rather than strictly scientific process, emphasizing the need to have tools that facilitate discussion with stakeholders throughout planning.

Emphasis on Visitor Planning

Planning for visitor use took on greater importance in the second half of the last century when visitation to natural areas increased dramatically. The increase was due to a variety of factors including changing mobility and rising technology (Newsome et al., 2002). Improved transportation made natural areas throughout the country available to larger regional, national and international populations. Technological developments, such as lightweight camping gear and global positioning systems, have made staying in the outdoors for longer periods more accessible to a wider audience. Further, an increase in guiding services in remote natural areas has made these places more attractive to a larger number of recreationists.

Shifts in education levels and lifestyles have also influenced the amount and type of recreation use in natural areas (Newsome et al., 2002). The last few decades have seen an increase in education levels due to improved access to educational resources. It has been suggested that with increased education comes an increased appreciation for the natural resources in our surroundings. Further, increasing urban centers and related stresses of urban life have led to a greater appreciation of the great outdoors (Newsome et al., 2002). More people seem to be seeking a reprieve from the pressures of everyday life by traveling more frequently and deeper into wildland areas to enjoy the serenity and natural beauty of these places.

Due to these changes in recreation activity, there has been concern that changes in use patterns and types in natural areas may threaten the values for which these places were originally protected and that attracted the first visitors (Newsome et al., 2002). Recreation use can impact natural and cultural resources, including degradation of valued resource characteristics. The level of degradation of individual resources may influence the appreciation of the resource and/or the natural or cultural integrity of the resource system. In addition, changes in use can lead to conflicts among users as a result of too many encounters with other visitors, as well as encounters with other types of users that may be considered incompatible (Newsome et al., 2002).

Visitor Capacity Decision Making

Originally, the concern over increasing and changing use levels and types and resulting impacts to recreation resources was addressed through adoption of the concept of carrying capacity. Carrying capacity began with wildlife and range management, where capacity was defined as the maximum population of species that a particular habitat can support over time (Dasmann, 1964). This concept of capacity is based on neo-Malthusian assumptions that populations grow exponentially until environmental factors limit growth (Seidl & Tisdell, 1999). The application of this concept to wildlife and range management seemed relatively straightforward until scientists and managers began to understand how different management actions (e.g., fencing, fertilizing, irrigation, rest-rotation) could affect the ability of the land to support a population of animals. Wildlife and range managers realized that the carrying capacity of an area was dictated by both biophysical components of the environment and capacity-altering management interventions (Seidl & Tisdell, 1999).

The carrying capacity concept was applied to parks and recreation management to address the relationship between visitor use and resource and social conditions. It has been suggested that the concept of carrying capacity was first introduced to the field of recreation management in the mid 1930s (Manning, 1999b). A National Park Service report on policy recommendations for parks in the California Sierras asked the question, "how large a crowd can be turned loose in a wilderness without destroying its essential qualities?" (Sumner, 1936). Over the next two decades, Wagar (1964, 1951) began the campaign to include carrying capacity as a major principle of recreation management. The Outdoor Recreation Resource Review Commission (1962) made the concept a formal part of the outdoor recreation field when it was included in its report, *Outdoor Recreation for America*.

Then it became law. The National Park Service is required to develop visitor carrying capacities in general management plans for all areas of a unit due to amendments to Public Law 91-383 (16 U.S.C. 1a-1). Carrying capacity is also required for any trail in the National Trails System due to amendments to Public Law 90-543 (16 U.S.C. 1241-1251). Land and resource management plans for units in the National Forest System that include wilderness areas must also provide direction for "limiting and distributing visitor use of specific areas" (National Forest Management Act of 1976, 16 U.S.C. 1600, Section 219.18(a)). These laws dictate that public agencies address the issue of carrying capacity in management plans. Stakeholders have also increasingly applied or threatened litigation over the perceived failure of the agencies to address this issue adequately in different planning efforts.

Originally, visitor capacity was based on the premise that the relationship between use and impacts is linear, with increasing use resulting in increased environmental impact as measured in soil compaction, vegetation damage, and water quality change (Lime, 1995) (see Figure 1, Line A). Similar to the initial application of the concept to wildlife and range management, this model of capacity led managers to conclude that limitations on use levels would reduce recreation impacts (Frissell & Stankey, 1972). Further, it encouraged a rest-rotation management strategy, where closing areas for some period of time and shifting use elsewhere would supposedly result in full recovery of resource impacts.

Upon further research and discovery, it was determined that the relationship between visitor use and resource impacts was more complex and frequently nonlinear. The majority of many types of resource impacts occur with initial use (see Figure 1, Line B). For example,

studies of camping impacts found that vegetation damage and soil compaction occur rapidly with limited use (as little as 10 nights/year). Near-maximum levels of degradation occur at intermediate levels of use (15-25 nights/year), with additional visitation resulting in diminishing increases in resource impacts (Marion & Leung, 1997). Further, the nature and extent of resource impacts from recreation use are highly influenced by use-related variables (e.g., mode of travel, group size, behavior, and timing of use), and environmental variables (e.g., resistance and resilience of vegetation, type of substrate) (Hammitt & Cole, 1998; Leung & Marion, 2000). For instance, studies of vegetation types show that grasses are substantially more resistant and resilient to trampling than forbs (Cole, 1987; Leung & Marion, 1996). A study in Great Smoky Mountains National Park found type of use to be a major influence on trail degradation (Leung & Marion, 1999). Trails with horse use were significantly wider, muddier and had more secondary treads than hiking trails. Further, the study showed trail location to be the most important factor influencing erosion. Trails along ridgelines and upper slopes exhibited the greatest erosion.
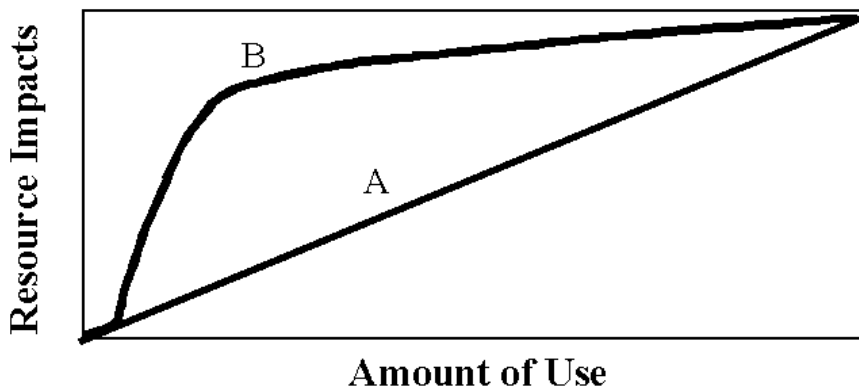
Figure 1: Conceptual Relationships Between Recreation Use and Resource Impacts

Such studies indicate that some degree of resource impact is inevitable in areas where recreation use is permitted (Cole, 1985; Leung & Marion, 2000). Further, in areas with substantial use, reductions in visitation would have to be dramatic to be an effective intervention. Therefore, it is not generally helpful to reduce use in heavily used areas to minimize the severity of resource impacts on designated trails, campsites and other facilities. However, use reductions, particularly during times of peak visitation, may be useful to limit the number of impacted sites

and the total area of disturbance. This is due to the larger number of camping and day-use sites required during peak visitation, and to trail widening caused by higher density visitation (Leung & Marion, 2000).

Findings from visitor impact research have shifted the focus of management in two fundamental ways. First, greater attention is devoted to evaluating the acceptability of resource impacts in different settings – reinforcing the need for defining desired conditions as a basis for decision making. Second, greater attention is devoted to conducting problem analyses that seek to understand the impact process and the role of causal and non-causal, yet influential, factors. Following such evaluations, managers select from a diverse array of impact management strategies and tactics (Cole, Peterson & Lucas, 1987; Farrell & Marion, 2002).

The notion of visitor capacity evolved further when it was acknowledged that there was another important dimension to the concept beyond the physical-biological qualities of the site, i.e., the quality of the visitor experience. Wagar's seminal conceptual monograph (1964) asserted two axioms regarding recreation carrying capacity (1) that the goal of management is to provide opportunities for high quality experiences and (2) that quality depends on how well recreation opportunities satisfy the needs that motivate people to engage in recreation activities. He suggested that increasing numbers of people would limit the ability of a recreation area to satisfy some recreational motivations, with solitude being the most sensitive motivation to increased use.

The interest in the concept of social carrying capacities has only become more entrenched over time as a result of media accounts of our national parks being "loved to death." Crowding has become one of the most frequently studied concepts in the recreation management field (Manning, 1999a, 1999b). Impacts on visitor experiences from increasing use levels and associated social and resource changes are highly dependent on visitor needs and motivations (Manning, 1999b). For instance, Lucas (1964) found that paddling canoeists in the Boundary Waters Canoe Area were more sensitive to crowding than motor boaters. A study of river floaters on the Colorado River found no relationship between use levels and perceived crowding measures, but correlations were found between expectations of contacts and preferences for contacts and perceived crowding (Shelby, 1980). Other studies have suggested that resource impacts associated with a specific type of use may intensify perceived crowding and conflict (Vaske, Graefe & Demptster, 1982). For instance, trash or trail degradation from a particular

user group might provoke negative impressions about that group, which may lead to higher perceptions of crowding during times of interaction.

The research on social carrying capacity has greatly expanded the knowledge on visitors' expectations, preferences and motivations for recreation opportunities. The recreation field has come to understand that visitors carry multiple expectations and motivations and that only a few may relate to use density (Cole, 2001). Also, it has been acknowledged that there is no average visitor, but rather that visitors may have widely divergent perceptions of preferred conditions for recreation settings (Manning, 1999b). Cole (2001) suggests that although density of use is not strongly correlated to the quality of experience, it may affect the nature of the experience – what it is the experience like for visitors (Cole, 2001). This greater understanding and appreciation of outdoor recreation as social behavior has helped move management emphasis away from controlling use levels to defining desired social conditions.

The capacity concept was further complicated by the recognition that management strategies such as fertilizing and irrigating vegetation, educating visitors and providing additional facilities, can influence one or many of the variables that affect the quality of desired resource and social conditions (Washburne, 1982). As noted by Marion (1995), the use of fire grates at Delaware Water Gap National Recreation Area reduced the total area of disturbance on canoe-accessed campsites by 50 percent in just five years, even with modest increases of use. A study in Isle Royale National Park found that the placement of campsites in sloping terrain on constructed cut-and-fill benches greatly constrained campsite sizes (Farrell & Marion, 1997). Camping shelters were even more effective in concentrating camping activities to reduce associated vegetation and soil impacts. Studies of education strategies have found that information provided to visitors to reduce social and resource impacts have been effective, especially in minimizing depreciative behavior such as littering (Manning, 1999b).

The research on management strategies has shown that unacceptable impacts to resources or visitor experiences may often be effectively minimized through changes in visitor behavior or structural components of the recreation setting. The level of mitigation or control of unacceptable impacts to recreation settings is mostly a factor of managers' willingness to commit funding, planning, and facility and regulatory resources to implement appropriate management strategies (Hendee, Stankey & Lucas, 1990; Manning, 1999b). Further, the research has demonstrated that it is important to understand the relationship between management strategies

and the social and resource dimensions of the recreation setting. Site management and other management strategies should not be initiated without consideration of the impact on social and resource conditions (Cole, 2001). In some instances, the strategy may be effective but not appropriate, based on the desired conditions of an area.

Because there has been resounding agreement based on several decades of research that visitor capacity is not "an inherent property of a place," the concept has lost a great deal of its original influence (Cole, 2001). However, even though there is not a strong relationship between use levels and resource and visitor experience impacts, the concept behind visitor capacity cannot be fully ignored. Recreationists still demand settings with characteristics such as solitude, adventure and low levels of visitor-caused resource impacts (Manning, 1999b). Further, studies that indicate a weak relationship between use levels and satisfaction for recreation experiences may be a factor of coping behaviors such as visitor displacement, rationalization and "product shift" (Manning, 1999b; Shelby & Heberlein, 1986). If sites are managed according to the results of studies relating impacts to visitor satisfaction, "there will be loss of diversity in outdoor recreation opportunities, particularly low use alternatives" (Manning, 1999b, p. 120). Finally, the term carrying capacity has pervaded legal and policy mandates of the various public agencies, so the concept must be addressed during planning (Cole, 2001).

Now, the visitor capacity concept is often considered a topical heading that refers to multiple approaches to recreation management, of which use limitation is only one option (Cole, 2001). There has been a dramatic shift in the capacity concept from the idea of *how much use is too much* to *what conditions are desirable* (Stankey, 1997). Decisions on desired conditions are subjective judgments that are based on the multiple values of managing agencies, stakeholders and the general public. To better reflect the value judgments made during these decisions, there has been an increased focus on collaboratively defining what conditions should be maintained and what levels of impacts are acceptable in relationship to these desired conditions (Krumpe & McCool, 1997; Stankey, 1997; Wondolleck & Yaffee, 2000). If changes occur that interfere with the attainment of desired conditions, actions must be taken to minimize impacts and obtain the desired condition.

Experiences with the visitor capacity concept have led to the conclusion that recreation management and planning is best dealt with through formulation of management prescriptions, which are statements of desired conditions (Cole, 2001; Lime & Stankey, 1971; Manning, 1997;

National Park Service, 1997; Stankey, Cole, Lucas, Petersen & Frissell, 1985). As a result of this new recreation management paradigm, there has been increasing focus by the major land managing agencies on the need to establish a collaborative vision for park resources and associated management strategies. A variety of decision-making frameworks have been developed to help guide visitor planning based on this new philosophy.

Management Decision-Making Frameworks

The United States Forest Service developed the Limits of Acceptable Change (LAC) framework in the mid 1980s as an alternate model for dealing with this new conceptual approach to recreation management in wilderness areas. The foremost concerns driving the development of LAC were increasing use in wilderness areas, resulting in increasing impact and management concerns. As noted by Cole and Stankey (1997, p. 5), "We were concerned about the incremental nature of human induced change in wilderness and felt that inadequate attention to management planning was a poor way to protect the investment American society had made in wilderness through the designation process."

The concept of Limits of Acceptable Change was first articulated in Frissell's masters thesis (1963) concerning campsite impacts in the Boundary Waters Canoe Area. Frissell concluded that with any amount of recreation activity, some degree of impact is inevitable. Therefore, the question is what level of impact is acceptable and how do we manage to achieve that standard. The developers of LAC believed that the purpose of visitor use planning was to reach a compromise between two conflicting goals, resource and visitor experience protection and access to recreational opportunities – these goals are codified in the Wilderness Act (Cole & Stankey, 1997). They believed the key to reaching compromise was to develop measurable and defensible standards of quality related to protection of visitor experiences and resource conditions – limits of acceptable change. The LAC framework formally changed the focus of planning from managing use to managing conditions. The paradigm shift embraced by this new approach is summarized by Lime (1995, p. 21), "Visitor capacity is a way of thinking about planning and management decisions, it is not a magic formula that gives the manager the answer to the continuing question, 'How much use is too much?'"

As originally formulated, LAC was issue driven rather than goal driven (Nilsen & Tayler, 1997). The LAC process focused data collection and analysis around issues and concerns, so no

management direction was provided on topics that had no perceived problems. The developers of LAC suggested that desired wilderness conditions seem self evident due to the Wilderness Act mandates (Cole & Stankey, 1997). However, it was suggested that the lack of attention to articulating goals or desired conditions was a shortcoming of the LAC process (Nilsen & Tayler, 1997). With the benefit of hindsight, the developers of LAC recognized that explicit statements for desired conditions of wilderness resources and values, not just management direction for issues and concerns, would be worthwhile (Cole & Stankey, 1997). In wilderness areas, goals and desired conditions would focus on topics such as preserving natural resource conditions, providing solitude, and preserving visitor freedoms (Cole & McCool, 1997). The desired conditions need to be specific to particular areas within the wilderness. These statements would help identify indicators of quality experiences and resource conditions, appropriate management strategies and guidance for dealing with situations where conditions are better than acceptable but worse than desired (Cole & McCool, 1997). Current application of LAC includes a new first step that involves defining specific desired conditions for an area.

The National Park Service (NPS) developed a similar management decision-making framework that benefited from the knowledge gained during implementation of LAC. The NPS realized the importance of goal-driven planning when they developed the Visitor Experience and Resource Protection (VERP) framework (Cole & McCool, 1997). Hof and Lime (1997) emphasized the importance of goals by suggesting that issues are obstacles that are between existing conditions and desired conditions; therefore, issues cannot be dealt with unless desired conditions are specified. The foundation of the VERP process is the step that includes definition of desired conditions of the resource and social setting for specific zones in a park or parkwide. This step in the process is defined as the development of "management prescriptions," which are specific narrative statements that describe the desired social, resource and related management conditions of a particular area in a park (NPS, 1997). In short, management prescriptions are *statements of desired conditions*. Management prescriptions focus on *what* we should manage for in terms of outcomes (e.g., In the backcountry zone, visitors will experience solitude and opportunities for self-discovery), rather than *how* we manage (e.g., In the backcountry zone, 50 visitors will be permitted to enter each day and assigned to designated travel-routes).

Prescriptions are further defined as the most specific park goals in a hierarchy that flows from general statements of policy and mission goals to management prescriptions. Management

prescriptions are resource specific (e.g., health of a riparian area) and geographically oriented (e.g., in the wilderness area of the park). Management prescriptions should provide a comprehensible picture of the character and quality of the various settings throughout a park. According to the National Park Service Sourcebook (1999) for general management planning, management prescriptions need to specify desired resource conditions and visitor experiences for particular areas based on resource concerns and a concern for diversity of visitor experiences. These statements are the foundation of guidance for sustaining high quality visitor experiences and natural resource conditions.

Due to the greater similarities than differences between LAC and VERP, this project focuses on the National Park Service's current use of the VERP framework. The VERP framework consists of nine interlinked elements that are outlined in Table 1 (NPS, 1997).

Table 1: Visitor Experience and Resource Protection Framework

Framework Foundation
1. Assemble an interdisciplinary project team.
2. Develop a public involvement strategy.
3. Develop statements of park purpose, significance and primary interpretive themes; identify planning constraints.

Analysis
4. Analyze park resources and existing visitor use.

Prescriptions
5. Describe potential range of visitor experiences and resource conditions (prescriptive zones).
6. Allocate zones to specific locations in the park.
7. Select indicators and standards for each zone; develop a monitoring plan.

Monitoring and Management Actions
8. Monitor resource and social conditions.
9. Take management action.

Similar to LAC, the purpose of the VERP framework is to move the emphasis away from considering amount of use as the primary factor in recreation management decisions. Rather, defining appropriate conditions for important resource and visitor experience variables is more relevant for influencing the quality of visitor experiences and resource conditions. One of the most important contributions of both LAC and VERP is the attempt to make value judgments explicit with regards to defining desired conditions for park resources (Krumpe, 2000).

Defining Desired Conditions

The focus on understanding and defining desired conditions involves a three dimensional concept that includes social conditions (e.g., visitor encounters), resource conditions (e.g., trail erosion), and management conditions (e.g., degree and extent of site management) (Manning, 1999b) (see Figure 2). Defining these dimensions and understanding the relationship among them demonstrates great progress for recreation management. However, deciding how to define desired social and resource conditions and related management conditions is difficult since decisions on desired conditions are influenced by many factors, including agency policies, managers' personal values, physical resources of the area, and attitudes and expectations of potential visitors (Hendee et al., 1990; Krumpe, 2000; Manning, 1999b). The definition of desired conditions becomes more difficult when there is not clear policy guidance suggesting the *appropriate* course for management. Further, the social, resource and managerial conditions that need to be defined are highly related – an alteration in one variable can influence the others, often resulting in the need to make tradeoffs (Lawson & Manning, 2001). For example, biophysical impacts from recreation can be concentrated and managed through site management techniques such as hardening of sites, channeling of use and development of facilities. However, the visual impact of site management techniques can affect visitors by reducing the perceived naturalness of an area (Hendee et al., 1990). Conversely, avoiding use of site management techniques to manage biophysical impacts may avoid this visual intrusion from the use of man-made materials, but potentially fewer people would be allowed to enjoy an area.
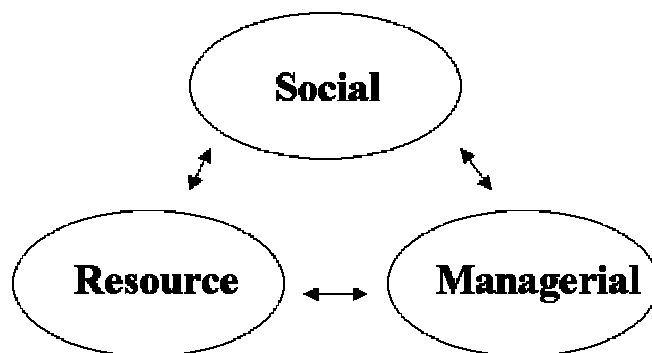
Source: Manning and Lime, 1996

Figure 2: Three Dimensions of Desired Conditions

The debates over appropriate social and resource conditions and related management for public land resources are steeped in value choices that must be made through a process that gives full consideration to law and policies, current scientific knowledge and visitors' and other stakeholders' preferences (Krumpe, 2000). It is often the visitor preferences that get overlooked in planning and day-to-day management due to the time and expense of collecting public input. In addition, there is often a debate over the best method for seeking input from visitors.

Visitor surveys are a common method of information collection that provide quantitative, generalized data. However, these data often fail to capture the depth of human perceptions and preferences for management of the landscape (Freimund & Cole, 2001). Qualitative methods such as focus groups and interviews are becoming more common for gaining a better understanding of meanings associated with recreation opportunities and activities for visitors, but often these methods are time and personnel intensive and provide information only for a limited population (Freimund & Cole, 2001). Before defining desired conditions for a place, planners and managers need to find multiple means for assessing visitor preferences, based on the information needs of the planning process. Also, when seeking input for defining desired conditions, it is critical to acknowledge the relationship among the multiple dimensions of the recreation setting and seek input that reflects these tradeoffs (Cole, 2001).

Improving Management Prescriptions

Once information has been collected and analyzed regarding desired social and resource conditions, a great deal of effort needs to be applied to articulating these conditions. One of the foremost concerns of early wilderness plans was the absence of specific, achievable management objectives for wilderness conditions (Cole & Stankey, 1997). The descriptions for desired conditions were too general, such as "maintain natural processes" and "provide solitude." Haas, Driver, Brown and Lucas (1987, p. 20) also suggested that most of the earlier wilderness management plans in the 1960s and 1970s contained "one generic management direction" for an entire area, and that this lack of "specificity" led to ineffective plans. Washburne (1982) suggested that avoidance of defining desired conditions detracts from the primary role of public land managing agencies, which is to decide what conditions are appropriate.

Plans need to provide accountability by specifying explicit and detailed management prescriptions that act as contracts for management, with success of meeting prescriptions

measured through frequent monitoring efforts (Cole & Stankey, 1997). The planning process needs to identify important resource and visitor experience elements specific to a park and then prescribe clear and unambiguous desired conditions for those elements. Further, the planning process must acknowledge that value-laden decision making in a highly politicized setting is more a process of negotiation than data collection and analyses (Krumpe, 2000). The process of developing management prescriptions must allow for stakeholders to debate the values, characteristics and features that should be perpetuated. As noted by Krumpe and McCool (1997), the resulting dialogue forces explicitness in the process, while also resulting in enhanced learning as different participants reveal their own value systems.

Although it has been stressed that the development of management prescriptions is the most critical management decision in the recreation planning process (Haas, 2001), little attention has been paid to providing guidance for developing *effective* prescriptive statements. For this study, *effective* prescriptions were defined as prescriptions that are helpful for making on-the-ground management decisions in an environment of competing interests. Research is needed to evaluate current attempts at developing management prescriptions in order to establish tools that will assist future efforts. Based on the experiences of public land management professionals, there can be increased understanding of the purpose and development process for management prescriptions.

Problem Statement

Visitor use planning for public lands helps to minimize unacceptable impacts and promote high quality visitor experiences by establishing desired conditions for a natural area. Planning also helps avoid problems that may arise from uninformed decision making (Newsome et al., 2002). Often, decisions that are made without any consideration of the larger social and resource context can have undesirable effects. Decisions regarding visitor use on public lands ultimately revolve around what should be, so planning provides a framework for addressing those value judgments. For this reason, the value orientation of visitors, managers and other stakeholders must be considered and incorporated into planning through definition of desired conditions (Newsome et al., 2002). Judgments about desired conditions reflect philosophical, emotional, spiritual, experience-based and economic responses (Newsome et al., 2002). Few people will have identical value judgments, so the planning process must attempt to identify and

reach compromise between stakeholders to determine desired conditions and how to achieve them.

Management prescriptions that describe these desired conditions have become widely accepted as an important component of public land management plans. Management prescriptions focus management strategies and provide a defensible link between actions, the park's purpose and the NPS' mission and goals. This component of the planning process establishes management guidance through consideration of both technical and value-oriented information. However, very little effort is spent on evaluating and learning about this part of the planning and decision-making process. Evaluation of tools and methods that facilitate and improve implementation of this component of the decision-making process is needed.

My research identifies and addresses the need to explore opportunities for additional guidance on the development of management prescriptions, by (1) evaluating the current perception of the purpose of management prescriptions; (2) developing criteria and other tools to guide the development of management prescriptions based on the experiences of public land management professionals; and (3) testing an alternative method for collecting visitor preference data regarding social, resource and managerial conditions to inform development of management prescriptions. The studies included in this research effort focused on the planning and management processes of the National Park Service.

Research Objectives

Research objectives include:

1. Reexamine the purpose of management prescriptions in public land planning based on experiences of public land management professionals.
2. Develop criteria that would guide the development of effective management prescriptions.
3. Develop guidance on appropriate desired resource, social and management condition topics for management prescriptions in National Park Service general management plans.
4. Test an alternative method for examining visitor preferences regarding the range of related and competing social, resource and managerial conditions that inform the development of management prescriptions.

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DISSERTATION STRUCTURE

The overall theme of this dissertation is identifying and addressing the need to explore opportunities for additional guidance on the development of management prescriptions. The format includes three journal articles: The first paper presents study findings from a visitor preference study in Acadia National Park in terms of visitor preferences for tradeoffs among social, resource and management conditions. The second paper analyzes the Acadia National Park study findings in terms of the differences among visitor preferences in three distinct recreation settings in the park. The third paper reexamines the role of management prescriptions for park management planning and investigates tools for facilitating development of management prescriptions.

CHAPTER II. MANAGEMENT OF RECREATION SETTINGS: AN ANALYSIS OF TRADEOFFS AMONG CONDITIONS IN ACADIA NATIONAL PARK

Introduction

Recreation is one agent of change in natural areas. As recreation use increases in an area, ecological impacts can be intense, but usually localized. These impacts are typically in the form of denuded campsites, visitor-created trails, introduced exotic species, damaged trees, soil compaction and erosion and wildlife displacement. The social effects of these impacts can include increased travel difficulty, degraded aesthetics, and safety hazards (Marion & Leung, 2001). In developed settings, the alternatives for management of biophysical and social impacts are extensive. Sites can be hardened, use levels controlled, and activities concentrated. However, the task of managing use and related impacts is much more difficult in places that are considered "backcountry" or "wilderness," where certain management actions may be considered obtrusive and inappropriate.

Increasing recreation use can also impact the social setting in terms of increased encounters between visitors and increased visitor conflicts. These changes in the social setting may affect the nature of visitor experiences – what the experience is like (Cole, 2001). Higher density experiences are not necessarily lower quality experiences, but they may not be appropriate in a particular area based on its legislative purpose, or its unique value for providing a particular type of recreational experience (Cole, 2001). Further, some options for managing the social setting, such as limiting use or restricting types of activities, may not be considered appropriate in particular areas. Managing recreation use levels and associated behavior may have a positive influence on the nature of the recreation experience for some, while having the opposite effect on other visitors.

The focus on understanding and defining appropriate management for recreation settings revolves around a three dimensional concept that includes social conditions (e.g., visitor encounters), resource conditions (e.g., trail erosion), and management conditions (e.g., degree and extent of site management) (Manning, 1999b). These conditions are interrelated - an alteration in one variable can influence the others, resulting in the need to make tradeoffs (Lawson & Manning, 2001). For example, biophysical impacts from recreational activities can be minimized through site management techniques such as artificial surfacing, channeling use

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and facility development. However, the visual impact of such site management techniques can reduce the perceived naturalness of an area. Use limitation is an alternative strategy for minimizing recreational impacts that avoids the visual intrusion of "hardened" sites and developed facilities. However, reduction of use levels will result in fewer people being able to enjoy the resource.

Recreation research has increasingly turned to various types of visitor preference surveys and methods as one way to help understand the public's perceptions of what constitutes appropriate management. Traditionally, preference studies have asked respondents to rate a series of setting attributes that were considered to be important to the recreation experience (Roggenbuck, Williams & Watson, 1993), or focused on evaluating the appropriate condition of a single attribute (Manning, 1999a). However, few preference studies have explicitly and simultaneously addressed the range of related and competing conditions that affect management decisions. The typical preference study does not allow participants to respond to the *relative* importance and/or level of the setting attributes being evaluated because it does not ask them to consider the tradeoffs inherent in recreation management decision making.

This study attempts to take a more integrative approach to recreation management by examining visitor preferences for tradeoffs among social, resource and related management conditions of the recreation setting. Stated choice analysis is used to examine visitor preferences for hypothetical tradeoffs among the conditions of social, resource and management attributes in different locations of Acadia National Park. Social conditions were represented by the number of encounters with other visitors, resource conditions were represented by the amount of trail widening present as a result of muddiness on the trail, and management conditions were represented by the percentage of visitors allowed access to the site and the level of development or site hardening along the designated trail. In relation to this study, it is assumed that visitors are aware of the attributes of a recreation site, and can articulate preferences and tradeoffs for those attributes.

Visitors who participated in the study were asked to choose which set of hypothetical resource, social and management conditions they prefer in the area they had just visited. Respondents' choices among the alternatives were evaluated to determine the relative importance of each of the attributes to the overall preference for the hypothetical recreation setting. In addition, the analysis allows for estimation of public preferences for alternative

configurations of the attribute levels (Dennis, 1998). This paper reviews the results of the study from Jordan Pond (JP), located on Mount Desert Island, in Acadia National Park.

To further investigate the results of the stated choice method and ensure the validity of the data, a verbal protocol assessment was applied to a sample of the stated choice survey respondents. The verbal protocol method asked respondents to think aloud as they answered questions in the stated choice survey. Respondents were asked to verbalize everything they were thinking as they considered the question and formulated an answer. The verbalizations were recorded and reviewed for emerging themes regarding the various considerations made by respondents while formulating their responses to the stated choice questions. The data collected during the verbal protocol helped evaluate respondents' understanding of the stated choice method and the salience of the study attributes. In short, the verbal protocol was used to ensure that respondents understood the task they were given in the stated choice survey; that they were able to consider the attributes in terms of tradeoffs; and that the attributes presented in the survey seem to be relevant to their preferences for management of the area. The richer, more detailed information of the verbal protocol provided context and insight for evaluation of the stated choice data.

The intent of this research was to improve planning and decision making for public land management by exploring the conceptual basis of preferences for social, resource and management conditions in recreation settings. Specifically, this study was undertaken to achieve the following research objectives:

1. Examine visitor preferences for tradeoffs among social, resource and management conditions.
2. Gain an improved understanding of considerations made by visitors in expressing their preferences for social, resource and management conditions.

Research on Preferences for Social and Resource Conditions and Related Management

The first attempts to identify visitor preferences for attributes of the recreation setting date back to the mid 1960s. Lucas' (1964) study in the Boundary Waters Canoe Area asked visitors, "how many other groups could be met in a day before you would feel there was too much use?" Over the last several decades, there has been a great deal of attention on identifying preferences for conditions to support planning and management decision making.

Preferences for social conditions.

There has been growing concern regarding the effect of increasing use on the quality of visitor experiences in outdoor recreation settings. Numerous studies have suggested that indicators such as the number of encounters along trails and the ability to camp out of sight and sound of others are important to visitors (Jacobi, Manning, Valliere & Negra, 1996; Lawson & Manning 2002; Manning & Lime 1996; Roggenbuck et al. 1993, Shafer & Hammitt 1994). National Park Service managers have also noted that too many encounters with other visitors is a problem at many or most popular features in the backcountry (Marion, Roggenbuck & Manning, 1993). However, studies that have tried to link level of visitor encounters to perceptions of crowding have found little or no relationship (Cole, 2001; Manning, 1999b). Further, studies that have tried to link level of encounters and/or perception of crowding to experience quality and visitor satisfaction have also found weak relationships (Cole, 2001; Manning, 1999b; Manning & Lime, 1996; Stewart & Cole, 2001).

However, there have been studies that have investigated visitors' preferences for levels of encounters in relation to their perception of crowding. These studies have shown that those who suggest that they feel crowded tend to report more contacts with other visitors than they preferred (Bultena, Field, Womble & Albrecht, 1981; Ditton, Felder & Graefe, 1983; Vaske & Donnelly, 2002). Although a strong correlation between encounters and experience quality has not been found, research has suggested that recreationists consider encounters with other visitors important, and most would prefer to see fewer people (Cole, 2001; Manning, 2003). Further, the recreation setting may influence the perceived importance of potential indicators of quality related to encounter rates and crowding. Visitors in more primitive areas may be more sensitive to encountering other visitors than visitors to more highly used areas or sites. From a management perspective, it is important to evaluate our success in meeting desired conditions to avoid the loss of desired recreation opportunities, rather than strictly focusing on measures of overall satisfaction or experience quality (Manning, 2003).

Preferences for resource conditions.

According to studies on trends in recreation management, resource impacts, especially on trails and campsites, are considered the most widespread recreation-related problems perceived by managers (Manning, 1999b). Although recreation use may not threaten the ecological

integrity of most areas, managers see site impacts as one of their foremost concerns. Recreation impacts also affect visitors through increased travel difficulty, degraded aesthetics, and safety hazards (Marion & Leung, 2001). Hammitt and Cole (1998, p. 295) note, "In many mountainous areas the most common cause of trail damage from the user's point of view is excessive soil moisture, which leads to development of muddy trails. Muddy stretches are difficult to walk through. Moreover, in an attempt to avoid the mud, hikers and horses frequently skirt the stretch and, in doing so, widen the quagmire." The most commonly cited problems of trail degradation are multiple treads, tread widening, root exposure and soil erosion. It has been suggested that these recreation-related changes are important because they are both inconsistent with policy to maintain natural conditions, as well as a negative influence on visitor experiences (Hammitt & Cole, 1998).

The majority of studies relating resource impacts to visitor experiences have been confined to wilderness areas. Cole, Watson, Hall and Spildie (1997) found that visitors to wilderness areas spend most of their time on the localized sites that have been highly disrupted, and the impacts were noticed. Most visitors who noticed the impacts indicated that it bothered them. Cole et al. (1997) noted that about two-thirds of visitors who noticed trail and campsite impacts reported that the impacts detracted from the quality of their experience. A study by Flood and McAvoy (2000) found that visitors to the Mission Mountains Wilderness noticed heavily impacted campsites and reported that the impacts diminished their experience. In another study, wilderness visitors rated vegetation loss and bare ground on campsites as two important determinants of their satisfaction (Hollenhorst & Gardner, 1994). Finally, a study in trends in recreational use in the Bob Marshall Wilderness Complex showed a six-fold increase in complaints about trail conditions from 1970 to 1982 (Lucas, 1985).

Other studies demonstrate that visitors might notice recreation impacts to campsites and trails, but they usually rate the resource conditions as "good" or better (Manning, 1999b). A study in the Mt. Jefferson Wilderness used on-site, semi-structured interviews to determine visitors' perceptions and evaluation of impacts to vegetation, soil and trees on campsites (Farrell, Hall & White, 2001). They found that 75% of the groups noticed vegetation impacts, 52% noticed soil impacts, and 51% noticed damage to trees, but more than 70% of the evaluative comments about conditions were positive. The interview data indicated that many of the positive evaluations were related to perceived functional benefits of impacts (e.g., large, denuded

campsites would accommodate large camping parties). Another study in the Selway-Bitterroot Wilderness Area found hikers to be satisfied with trail conditions, even though some trails were severely eroded (Helgath, 1975).

It is not clear why research results regarding visitors' evaluation of resource conditions have differed significantly. Different research methods, as well as a focus on different impacts (e.g., litter versus vegetation impacts) may explain some of the variation in study conclusions (Farrell et al., 2001). Even though there may not be a direct relationship between visible resource degradation and impacts on visitor experience, the concept of preferences for resource conditions cannot be fully ignored. Recreationists demand settings that have certain characteristics such as low levels of resource damage. The question is, which information takes precedence, the science on relating conditions to satisfaction/experience or the stated preference of visitors? Since decisions on management of public land resources must be made, and these decisions must include input from visitors and other stakeholders, identifying visitor preferences for conditions of recreation areas and related management strategies is a viable and important component to planning.

Preferences for management strategies.

Managers, planners and researchers have struggled with ways to effectively address unacceptable visitor-caused impacts to social and resource settings. Over the last 30 years, numerous strategies for managing visitors on public lands have been identified. The five primary strategies include modifying the character of visitor use by controlling where, when or how use occurs, modifying the resource base by increasing resource durability, increasing supply of recreation opportunities, reducing use, and modifying visitor attitudes and expectations (Anderson, Lime & Wang, 1998, Marion et al., 1993). The visitor survey research in this study examines two of these approaches in relation to managing social and resource conditions in Acadia National Park. The level of development on trails will represent the strategy of increasing resource durability, and the restriction of access to an area will represent the strategy of reducing use.

As noted by Hammitt and Cole (1998), site management, after proper location, is the best defense managers have to reduce deterioration of recreation facilities such as trails and campsites. For example, off-trail trampling can be reduced by trail edging or fencing, and

damage to trail treads could be avoided by applying gravel or pavement. However, even subtle changes in the design and type of facilities can "alter the character of the site to the point that it may no longer be satisfactory to many current users" (Lime, 1995, p. 25). Some would argue that any facilities or site improvements change the experience, attract a different type of visitor, and therefore should be avoided. Improvements often facilitate access, and can increase use and promote different kinds of visitors, particularly novices (Cole, Peterson & Lucas, 1987; Jubenville 1995). Jubenville (1995, p. 23) claims it is a cycle, "the easier access leads to increased use, which causes more environmental impact, further reducing naturalness, and leads to even more protective development by managers." As the cycle evolves, the resource conditions deviate further from the mandated "natural" conditions. Furthermore, visitors originally attracted by the area's naturalness may be displaced and replaced by users with different perceptions and preferences. Due to the potential alteration of use levels and types of users, Jubenville (1995) suggests that the solution to keeping natural areas wild depends on how we manage our trails. He believes primitive trails are the key to keeping use and impact within acceptable limits, corresponding to maintaining the natural state of protected areas.

There have been some visitor studies on preferences for various levels of development, but most studies have been confined to wilderness areas. For example, visitor surveys in nine wilderness areas by Lucas (1980) indicated little support for high standard trails, but strong support for low-standard trails. Bridges were favored in areas where safety is an issue, but not in areas where visitors merely got their feet wet. Low standard of development is the preference, but this doesn't mean badly eroded or large mud holes are acceptable. Research has also demonstrated that visitor preferences generally favor the current level of facility development (Cole, Peterson & Lucas, 1987). Little research has examined whether preferences may vary between different recreation settings.

Limiting visitor use has received a great deal of attention because it runs counter to the basic philosophy of providing public access to public lands. Minimal regulation of visitors has always been considered critical to maintaining satisfactory experiences, especially places that are considered primitive (Hendee, Stankey & Lucas, 1990). However, use limits may be needed to manage resource and social conditions. Managers must be certain that social and resource problems dictate the need for limiting use rather than implementing other less intrusive management alternatives (Manning & Lime, 2000).

Use limits are more widely accepted when the public understands that maintaining acceptable biophysical or social conditions depends on implementing use limits (Anderson & Manfredo, 1986; Cole et al., 1987; McCool & Christensen, 1996). For example, Watson and Niccolucci (1995) found that visitors to three wilderness areas in Oregon supported use limitations to protect resources and the quality of visitor experiences. Also, studies have found support for use limitations in areas where use limitations are already in place (Bultena et al., 1981; Fazio & Gilbert, 1974).

Research on Tradeoffs among Setting Conditions Using the Stated Choice Method

Many studies that examine social, resource and management conditions independently conclude that future management decisions must examine the relationship of these components of recreation settings. For example, the obtrusiveness of site manipulation must be carefully weighed against the obtrusiveness of site impacts and other means of solving problems (Hammitt & Cole, 1998). Identifying and understanding current user groups' preferences for resource, social and management conditions cannot be achieved in the absence of a clear understanding of the tradeoffs required to achieve these conditions. For example, wildland visitors would likely prefer unimpeded access, but want to avoid high levels of crowding and conflict while recreating in pristine settings that lack unnecessary developments. Such optimum levels for each of these conditions are not generally achievable, making tradeoffs necessary. Evaluation of visitor preferences for different desired conditions and related management strategies should be placed in the context of these tradeoffs. The stated choice method is one approach for integrating considerations about social, resource and management conditions (Green, Tull & Albaum, 1988). This analytical method can be applied to enhance our understanding of the relative importance of resource, social and management conditions from the visitor's standpoint.

A recent study by Lawson and Manning (2002) used stated choice analysis to examine the tradeoffs among resource, social and management conditions of the Denali wilderness experience. Of the attributes presented to respondents, the study found that resource conditions, specifically, signs of human use at campsites, was the most significant setting attribute related to overnight wilderness visitors' preferences for recreation settings. Social conditions comprised the second tier of importance, including number of encounters with other groups each day and opportunities to camp out of sight and sound of other groups. Although less important, these

attributes still accounted for a relatively large influence on visitors' preferences. The results also suggest that wilderness visitors support some level of management over where visitors may camp and a certain degree of use limitation. The authors suggest, "Visitors may realize that without certain management restrictions, the resource and social setting attributes of the Denali wilderness are likely to deteriorate beyond acceptable conditions" (p. 305).

Another stated choice study examined the effects of changes in mountain bike trail characteristics and introduction of access fees to biker preference on trail selection (Morey, Buchanan & Waldman, 2002). Results indicated that the presence of single-track trails is a highly influential consideration for trail site selection. In addition, the presence of hikers and equestrians has a significant impact on preferences for site choice. Trail difficulty was also an attribute that was valued by bikers, but only up to a certain degree of difficulty. Results also indicated "significant numbers of bikers would be willing to pay an access fee for improved conditions, but the amount would depend on the number of substitute sites and the trail characteristics and fees at those sites" (Morey et al., 2002, p. 420). The authors suggest that the stated choice model could be used to estimate how mountain bikers would value a change in the characteristic of a site or sites, including the addition of a new site or the elimination of an existing one.

Two other studies used stated choice modeling to examine the impact of user fees at public recreation sites (Anderson & Louviere, 1993; Louviere, Louviere, Anderson & Woodworth, 1986). Both studies demonstrated that the negative impacts of fees on people's preferences for a recreation site might, in some cases, be offset by changes in other attributes of the recreation site. For example, both studies showed that a large reduction in crowding or noise accompanied by a fee increase would be considered a favorable trade-off among respondents (Schroeder & Louviere, 1999). This type of information could be helpful to managers in understanding what changes in site attributes may help compensate for increases in fees for a recreation area.

Evaluation of the Stated Choice Method

Stated choice analysis would provide one means of collecting visitor preference information prior to implementing management actions, and to assist efforts of defining desired conditions during management planning. By considering the social, resource and management

conditions of recreation settings simultaneously, the stated choice method is more holistic and contextual than other approaches to measuring visitor preferences (Lawson & Manning, 2002). Further, the addition of the verbal protocol assessment in this study provides data on how respondents interpret and respond to stated choice questions. The verbal protocol provides insight on the relevance of the various attributes to respondents and how they determine their preferences for setting attributes. These methods should complement other forms of public input provided during planning and management decision making.

The verbal protocol method.

The verbal protocol method asks respondents to verbalize any and all thoughts on their mind as they answer questions or undertake some other requested task. In this study, respondents were asked to say out loud everything they were thinking as they considered each stated choice question and formulated an answer. The verbal protocol method emphasizes collection of information that is found in respondents' short-term memory, during the actual decision making. It has been suggested that when a respondent is asked about how a decision was made after the fact, there is much less information in the short-term or working memory (Ericsson & Simon, 1993). The verbal protocol method is best applied to evaluating the thought process during unfamiliar and complex tasks than more familiar and simplistic tasks because the response pattern is not already learned (Svenson, 1989). This description would generally fit most stated choice survey procedures.

One purpose of including the verbal protocol analysis in this study is to examine the relevance of the attributes being provided to the recreation visitor for evaluation. Some studies have suggested that the more relevant an attribute, the greater the ability of the visitor to express a preference or standard (Manning, 1999b; Roggenbuck et. al, 1991). How to test for the salience of a particular attribute has not been clearly defined. The stated choice method provides a statistical means for examining the relative importance of each attribute to the overall utility (i.e., desirability) of a recreation setting. However, the method cannot examine the basis for the relative importance of each attribute, including what is being considered in determining a response. Are participants responding to the specific attributes of the public good being tested or are other considerations taking part in the final choice (Schkade & Payne, 1994)?

In addition, the stated choice method assumes that at least some of the attributes being measured have some degree of relevance because the question format requires a response. It has been suggested that visitors have difficulty expressing preferences for attributes presented in most visitor studies, and if given the option, respondents are likely to admit that they cannot indicate a norm for a condition (Roggenbuck et al., 1991). When employing the stated choice method, are respondents truly considering the tradeoffs of all the various attributes and selecting a preferred scenario, or are they focusing on one dominant/preferred attribute and making a choice? Further, are they finding stated choice questions difficult to answer or are the questions confusing, and if so, what mechanisms are respondents using for answering? The use of verbal protocol in conjunction with a stated choice survey may provide evidence of the degree to which respondents are considering the multiple tradeoffs that are presented or merely making random or haphazard choices. The verbal protocol assessment provides a tool for gaining additional insight on the relevance of various attributes to respondents.

Verbal protocol assessments have been used in multiple ways to study thought processes related to decision making. Further, these studies have been applied to environmental policy issues such as the study of responses to contingent valuation questions (McClelland et al., 1992; Schkade & Payne, 1994). This method has also been used to evaluate recreation management issues, such as recreation site preferences (Steve Lawson & Robert Manning, personal communication; Vining & Fishwick, 1991). There has, however, been little application of verbal protocol with stated choice methodology. This study examines how people respond to stated choice questionnaires and more specifically how they perceive and evaluate the attributes included in the study. Through a better understanding of how individuals interpret and respond to stated choice questions, there is some context within which to analyze and present the quantitative data resulting from the stated choice survey.

Study Area and Methods

Acadia National Park

Established as Lafayette National Park in 1919 and renamed to Acadia National Park in 1929, this National Park Service (NPS) unit was the first national park east of the Mississippi River. Today, the National Park Service manages approximately 36,000 acres of Atlantic Coast shoreline, granite mountains, mixed hardwood and spruce/fir forest, mountains, lakes, and

several offshore islands. Acadia hosts over three million visitors a year, and primary recreation activities include hiking, bicycling, camping, touring, picnicking, photography and nature observation.

Jordan Pond (JP) is located on Mount Desert Island, which is the most developed area of the park and receives the highest level of visitation. This site was selected as a representative site for a frontcountry setting (i.e., high use and high levels of development). The trails around JP are highly developed, including the use of gravel, culverts and bridging. Adjacent to the trails around JP is the Jordan Pond House, which is a full-service dining establishment. This area of the park is often one of the first stops for park visitors.

Selection of Attributes and Levels

As summarized by Manning (1999b), there has been research conducted on identifying the ecological, social and management attributes that contribute to or detract from the nature of recreation experiences. Based on a literature review, including park documents, and review of recent park visitor survey research, numerous attributes were considered to define the social, resource and management conditions of the Jordan Pond setting profiles. Four attributes were selected that were considered to be managerially relevant and likely to influence recreation site preferences. The social setting is represented by encounters with other visitors; the resource setting is represented by the condition of designated trails in terms of widening as a result of muddiness; and the management setting is represented by levels of public access and levels of trail development. Four levels were provided for each attribute, representing the range of conditions likely to be encountered in the park. These levels were based on discussions with other researchers and park staff (see Table 2).

Table 2: Acadia Recreation Setting Attributes and Levels used in the Stated Choice Survey

Social Conditions
Level of Encounters
1   Visitors encounter no other groups during a hike.
2   Visitors encounter up to 5 other groups during a hike.
3   Visitors encounter up to 10 other groups during a hike.
4   Visitors encounter up to 20 other groups during a hike.

Resource Conditions
*Ecological Condition of Official Trail ***
1   Trails show no signs of widening or secondary trails.
2   Visitor use on trails with wet soils has caused a slight amount of trail widening.
3   Visitor use on trails with wet soils has caused a moderate amount of trail widening.
4   Visitor use on trails with wet soils has caused extensive trail widening and formation of secondary trails around wet areas.

Management Conditions
Public Access
1   The number of people allowed to hike in this area is not limited.
2   The number of people allowed to hike in this area is limited – around 75-80% of interested visitors are able to gain access.
3   The number of people allowed to hike in this area is limited - about half of interested visitors are able to gain access.
4   The number of people allowed to hike in this area is limited – around 25-30% of interested visitors are able to gain access.

*Trail Management ***
1   There are no management-constructed features along trails (e.g., stepping stones, wood planking, gravel).
2   Stepping stones are placed along sections of trails.
3   Wood planking is placed on sections of trails.
4   Gravel is placed on sections of trails.

* Portrayed in the survey with these narrative statements, as well as photos.

Experimental Design

Since each attribute was assigned four levels, a full factorial design would have produced a total of 4^4 (256) hypothetical recreation settings. This large number of settings was too many choice sets for a survey participant to evaluate. An experimental design called fractional factorials was used to produce a smaller subset of site descriptions. The factorial design combined the four recreation setting attributes at varying levels to result in 32 paired comparisons blocked into four questionnaire versions. Each questionnaire version included eight pairwise comparisons. An example of a typical Acadia recreation setting comparison is

presented in Figure 3. Respondents were asked to choose either Recreation Setting A or Recreation Setting B.

Recreation Setting A	Recreation Setting B
The number of people allowed to hike in this area is not limited.	The number of people allowed to hike in this area is limited - around 25-30% of interested visitors are able to gain access.
Visitors encounter up to 5 other groups during a hike.	Visitors encounter up to 5 other groups during a hike.
Visitor use on trails with wet soils has caused extensive trail widening and formation of secondary trails around wet areas. (See photo below)	Trails show no signs of widening or secondary trails. (See photo below)
There are no management-constructed features along trails (e.g., stepping stones, wood planking, gravel). (See photo below)	Wood planking is placed on sections of trails. (See photo below)

Figure 3: Example Recreation Setting Comparison used in the Stated Choice Survey

Survey Administration

Surveys were administered July 1-August 15, 2002, generally between 10 am to 6 pm on both weekend and weekdays. The stated choice survey was conducted using self-administered questionnaires. Randomly chosen participants were asked to answer the questions included in

the stated choice survey while participating in the verbal protocol assessment, which was tape-recorded (with consent) and transcribed verbatim.

During the survey, respondents were presented with a series of eight pairs of alternative settings defined by four attributes. For each pair, respondents were asked to choose the setting alternative they prefer. A small number of questions were included at the end of the questionnaire to gather information about visitor characteristics, visitors' trip experiences, and visitors' assessments of the stated choice questions (see Appendix A).

The survey attendant read a set of instructions for the verbal protocol to those visitors asked to participate in the verbal protocol assessment, which included a request for permission to tape record the interview (see Appendix B). The respondent was then given two practice questions. After completing the two practice questions, the respondent was asked to continue thinking aloud as they completed one of the four versions of the stated choice questionnaire. The respondent was prompted to think aloud if he/she remained silent for more than 30 seconds during the verbal protocol assessment. The verbal protocol assessment instructions and questions are based on the widely cited examples provided by Ericsson and Simon (1993).

At Jordan Pond, 203 stated choice surveys were completed over eight survey days, with a 67% response rate. Fifteen verbal protocol assessments were also completed. The close proximity of the Jordan Pond House Restaurant influenced participation to some degree. When asked to participate in the survey, some respondents refused and stated they were on a tight time schedule due to reservations for the Jordan Pond House.

Stated Choice Model

The method, as applied in this study, asked respondents to identify their preferences among alternative recreation scenarios that present varying levels of resource, social and management conditions. Outcomes of stated choice models are explained using the well-established decision-making framework of random utility theory (Hanemann, 1984; Opaluch et al., 1993). This theory assumes that the attributes of alternatives relevant to a given choice are evaluated in terms of the utility they provide the respondent. Further, the utilities associated with each of the attributes are combined into an overall utility (i.e., desirability) for each alternative, after which the alternative with the highest overall utility is selected (Lindberg, Dellaert &

Romer Rassing, 1999). For this study, the individual would choose recreation setting A over recreation setting B for an area in Acadia National Park if

$$U(X^A) > U(X^B)$$

where U(i) is the individual's utility associated with Acadia recreation setting $i(i$=A,B), and X^i is a vector of variables describing the attributes of Acadia's recreation setting under alternative i (Opaluch et al., 1993). Further, the random utility theory establishes that the individual's utility is composed of both a measurable component and unobservable component (Hanemann, 1984). The unobservable component may consist of measurement error, omitted explanatory variables, and random choice behavior (Dennis, 1998). In formula, the random utility model is expressed as follows:

$$u(X^A) + e^A > u(X^B) + e^B$$

where $u(i)$ is the measurable component of the individual's utility that is estimated empirically and used to develop recreation setting scores and e^i is the unobservable component of utility (Opaluch et al., 1993). The recreation setting scores are based on the utility coefficients for all attribute levels, which are estimated using multinomial logit regression analysis procedures based on maximum likelihood estimation (Opaluch et al., 1993; Schroeder & Louviere, 1999). In short, the utility coefficients derived for each of the attributes, which can also be considered numerical weights, are used to score alternative setting choices. In this study, all of the coefficients for each of the attributes were significantly greater than zero at the 5% level. The overall fitness of the model is supported by the results of the Chi-Square Goodness of Fit test, with p<.0001.

The final step of the analysis is to use the recreation setting scores to determine the probability that a randomly selected individual would choose a particular recreation setting from among the pair of alternatives with given attributes (Opaluch et al., 1993). This probability can be expressed as

$$P^A = \Pr(\theta < D^u)$$

where P^A is the probability that the individual would prefer alternative A over alternative B; θ is the difference in the unobservable components of the individual's utility (e^A-e^B) and D^u is the difference in the measurable components of the individual's utility {$u(X^A)$-$u(X^B)$)} (Opaluch et al., 1993). This information can be used to test hypothetical scenarios that may be considered during planning efforts or day-to-day decision making.

To estimate the probability of support for recreation setting A over setting B, a statistical procedure called the logit transformation is used (see Hanemann, 1984; Opaluch et al., 1993; Schroeder & Louviere, 1999). The logit transformation converts each recreation setting's utility into a choice probability, a number between zero and one (Schroeder & Louviere, 1999). If the probability were zero, than the visitor would never choose that recreation setting. If the probability were one, he/she would always choose that setting. Therefore, the probabilities of all of the setting options in the choice set must sum to 1, given that each person must choose an option from the set (Schroeder & Louviere, 1999). In summary, the setting scores allow for prediction of the proportion of individuals that would choose each recreation setting for a particular area in a hypothetical referendum based on the attributes of the choice settings (Opaluch et al., 1993).

Verbal Protocol Assessment

The results of the stated choice surveys using the verbal protocol assessments were combined with the results of the surveys done without the verbal protocol. Verbal protocol has not been found to affect primary decision tasks (Barber & Roehling, 1993; Ericsson & Simon, 1993; Schkade & Payne, 1994). The verbalizations recorded during the verbal protocol assessment were reviewed for emerging themes to provide insight to the considerations made by visitors when contemplating tradeoffs among social, resource and management conditions. The emerging themes helped determine whether visitors understood the questions being asked and if visitors were truly contemplating the tradeoffs among the resource, social and management attributes presented, as the stated choice method intends. If, for example, visitors express confusion over the questions or seem to be keying in factors other than the attributes presented, it would be necessary to acknowledge this information when presenting the quantitative stated choice data.

Results

Evaluation of the Stated Choice Method

Based on review of the verbatim transcripts from the protocol analysis, people were able to consider the attributes of the recreation settings presented to them, as well as articulate preferences for those attributes that were based on a variety of considerations, beyond pure conjecture. There were no protocols that demonstrated that people misunderstood or could not complete the requested task. In addition, there were numerous protocols suggesting that respondents struggled with making the tradeoffs because many of the attributes were important to them. The following are two protocols that demonstrate the level of contemplation over the suggested tradeoffs in the stated choice survey:

> … although in setting A I would prefer to encounter fewer groups, such as the 5 encounters in setting A during a hike; overall, I feel setting B would be better. I would like most people to be able to use [the trail] if they wish and that there is some maintenance and upkeep, but it is more rustic. It leaves hiking to those that truly want to hike… (7/12/02, Group Q).

> …I really prefer that the number of people allowed, at least at this point in time, is not limited and visitors encountering up to 10 other groups per hike is just fine with me…moderate amount of trail widening under setting A…uh I think that is just going to happen…gravel is placed….I would prefer the gravel to the stepping stones…I think I would strongly prefer setting A from what it seems to say… (7/11/02, Group B).

Based on review of the verbal protocol transcripts, there seemed to be two different types of choice processes used. The most common choice process involved a comparison of the different features of the setting in terms of positive and negative attributes, with the choice based on which recreation setting had the greatest number of positive features. The following is one example to illustrate this type of choice process:

> … I would obviously prefer a trail looking like this, than one with a puddle…what's not preferable about that…oh but then I'd encounter 20 other groups rather than 10 so…do I care more about the trail's condition or seeing other people…I guess I would prefer B. (7/27/02, Group M)

This may be considered a compensatory decision model, where the presence of positively evaluated features offset negative features (McCool, Stankey & Clark, 1985). For the most part, it was not the same combination of features that led respondents to a positive evaluation of a setting choice. It is this type of choice process that suggests that respondents were able to consider the tradeoffs between different setting conditions.

Another method, although rarely used, involved looking through the setting choices for the attributes that fit the respondent's criteria. For example, a choice setting that restricted access to any degree may be rejected even if the other attributes were considered a positive contribution to the recreation setting. Here is one example:

> …I feel so strongly about only the first one [level of access] that I can't even consider the other setting…to be turned away from a trail to me is like…I would say setting B. (7/27/02, Group W).

This decision-making method may be considered noncompensatory, where no attributes could compensate for a negatively evaluated attribute at a particular level (Vining & Fishwick, 1991). This type of choice process was used by two respondents at Jordan Pond in relation to opposing access restrictions. In these instances, it seemed that respondents were not weighing the tradeoffs because they considered that issue too critical to accept alternative management options.

Further analysis of the transcripts indicated that the responses to the stated choice questions seem to be constructed from a variety of considerations. The most common considerations were related to the implications of setting attributes (e.g., cost, replacement frequency, feasibility, impact to resources, impact to visitor experience…), visitor safety and/or accessibility of the setting attributes, and the comparison of the hypothetical setting choices to current conditions of Jordan Pond. The following two examples illustrate respondents' consideration of the management implications of the attributes presented in the setting choices:

> … I don't believe there should be no management constructed features around the trails…there should be stepping stones or planking as long as it doesn't impact negatively on natural resources…on natural flora... (7/13/02, Group J)

> …the one I have a problem with is the extensive widening…that could probably be solved with the gravel and raising the trail just a bit and allowing for the runoff…and I do think there should be management constructed features such as gravel… (7/11/02, Group B).

The following are two examples of respondents considering the implications of setting attributes on visitor safety and accessibility.

> …so now as an aging person, I have been coming here for years and years...stepping stones are wonderful and I would gladly leap over all the stepping stones, and as I age and the population is aging, planks are so much more safety oriented, there is less opportunity for twisting an ankle or slipping (7/12/02, Group K).

… like I said before we ought to try and not limit people, in fact, I think that having nicely graveled trails will allow people with wheelchairs to see parts of this trail (7/11/02, Group B).

Finally, one of the most frequently mentioned considerations involved comparisons of the hypothetical setting choices to current conditions at Jordan Pond, either in terms of how the hypothetical setting choice is similar, or whether the setting attributes are necessary based on current conditions in the area. Here are two examples of this line of reasoning:

… while we have been sitting here talking, there has been one group go by…while I was taking the test there was one group…certainly that is not a very limiting factor...I think if everyone at Jordan Pond restaurant right now decided to hike you'd have a little traffic congestion, but I don't think that is going to happen… (7/12/02, Group B)

…as it is today, I would prefer A...people allowed to hike are not limited so that when you arrive here you wouldn't be disappointed, and also today is a beautiful summer day and there doesn't seem to be too many people…you are not passing person after person and that seems all right… (7/13/02, Group A).

In addition to these considerations, respondents voiced other concerns when making a choice between recreation setting options. These considerations, although mentioned less frequently, included the relationship of setting attributes to the type of experience sought, the availability of other opportunities within the park, and the aesthetic value of the setting attributes. Identification of the considerations made during the choice process suggests that respondents' choices were often not a direct tradeoff of one attribute for another. Rather, multiple interpretations and concerns related to the attributes were considered when weighing the pros and cons of each hypothetical setting choice.

Preferences for Social, Resource and Management Conditions

Respondents were asked in the second half of the survey to rank the importance of the individual variables presented in the stated choice portion of the survey, on a scale from 1 to 5 (1=not at all important to 5=extremely important). The results of this question are summarized in Table 3. The information collected from this portion of the survey confirms that these variables were all considered moderately important to visitors, with mean rankings for most of the variables between three and four.

Table 3: Summary of the Rated Importance of Social, Resource and Management Attributes to Jordan Pond Visitors on a Scale from One to Five

Setting Attributes	Mean (N= 202	Standard Deviation	Standard Error
Importance of access	3.88	0.99	0.07
Importance of encounters	2.74	1.0	0.08
Importance of visitor created trails	3.26	1.24	0.09
Importance of condition of official trails	3.64	0.92	0.06
Importance of level of development	3.27	1.08	0.08

Scale: 1=not at all important, 5=extremely important

This information confirms initial assumptions about preferences for the social, resource and management attributes presented in the stated choice survey. However, the investigation of the stated choice data that presents tradeoffs among these attributes allows a better understanding of the relative importance of these attributes to visitors. In short, asking visitors about preferences for multi-dimensional settings, consisting of multiple attributes at varying condition levels, forced visitors to consider the potential tradeoffs among the conditions and base their preferences on the attributes that were most important. To further examine the effect of the varying levels of attributes on respondents' preferences for recreation settings, the stated choice model was used to translate setting scores into predicted proportions of visitors that would vote for each recreation setting in a hypothetical referendum based on the setting attributes (Opaluch et al., 1993). First, the relationship of the effect of changes in the individual attributes can be analyzed by comparing the predicted proportions of visitors that would choose each recreation setting, holding all but one attribute at a constant level. Figure 4 demonstrates the effect of changes in visitor choice probabilities for each attribute level at Jordan Pond.
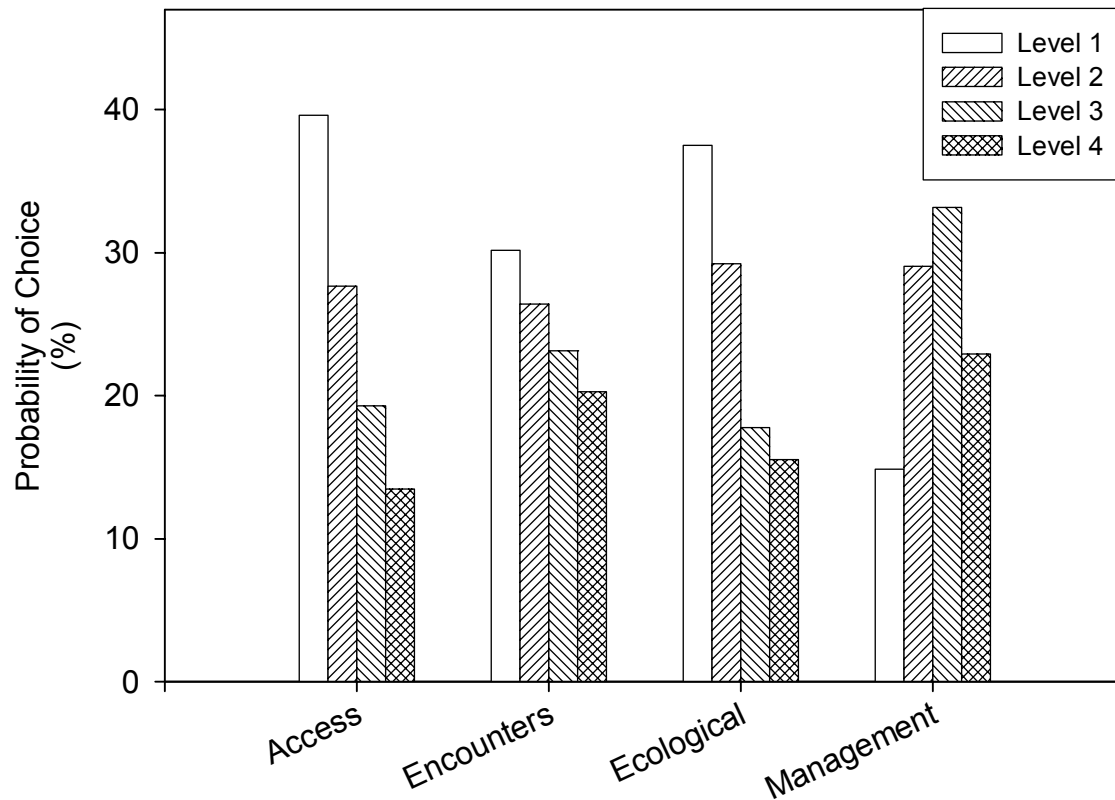
Visitor Preferences for Each Attribute at Levels 1-4 for Jordan Pond

Figure 4: Visitor Preferences for Each Social, Resource and Management Attribute at Levels 1-4, Holding All Other Attributes Constant, at Jordan Pond

Visitors to Jordan Pond would prefer a recreation setting with minimal or no access restrictions, low encounter rates with other visitors, and minimal to no resource impacts on formalized trails. Further, JP visitors would prefer wood planking, stepping-stones or gravel versus no development on trails.

The analysis also illustrates the effect that changing levels of the attributes have on the probability of visitors choosing a particular recreation setting scenario. For example, changing levels of access restrictions has a more dramatic effect on visitor preferences than changing levels of encounters. If preferences between the highest and lowest level of the access attribute are compared, a visitor is almost 3 times more likely to choose a setting scenario with access at level one (least restrictive) than level 4 (highest restrictions). On the other hand, although visitors would prefer low encounters, they are only 1.5 times more likely to choose a setting

scenario with level 1 (least encounters) than level 4 (highest encounters). Thus, maintaining access opportunities is more important to visitors than the number of encounters along the trail. Further, ecological conditions were an important variable to Jordan Pond respondents. The model predicts that the majority would prefer conditions with little to no widening or secondary trails. Finally, visitors preferred wood planking and stepping-stones to other forms of trail management, including no management. Anecdotal information collected on-site and the verbal protocol assessment suggested that visitors preferred higher levels of trail development to improve visitor safety and accessibility.

Preferences for Tradeoffs among Social, Resource and Management Conditions

In an ideal world, each of the sites could be managed for each of the attributes based on the highest preferences. However, increasing use, unpredictable visitor behavior, and the varying sensitivity of natural resources requires consideration of tradeoffs among these attributes. The stated choice method allows analysis of the respondents' preferences for tradeoffs among the various attributes of the recreation setting. For example, the model can be used to examine preferences for the possible relationship between variables such as level of access and level of visitor encounters, or level of ecological impacts and level of trail development.

The effect on the probability of visitors choosing a recreation setting with the hypothetical tradeoff between restricting access to reduce levels of encounters is demonstrated in Figure 5. The results of the analysis demonstrate the differences in preferences for settings with no access restrictions and high levels of encounters to settings with higher levels of access restrictions and lower levels of encounters. As noted previously, visitors to Jordan Pond prefer no restrictions on access and low levels of encounters with other visitors. However, it appears that Jordan Pond visitors would be willing to trade off higher encounter rates for fewer restrictions on access to the area. This hypothetical scenario is based on the assumption that reducing access to the area would influence the level of encounters between visitors.
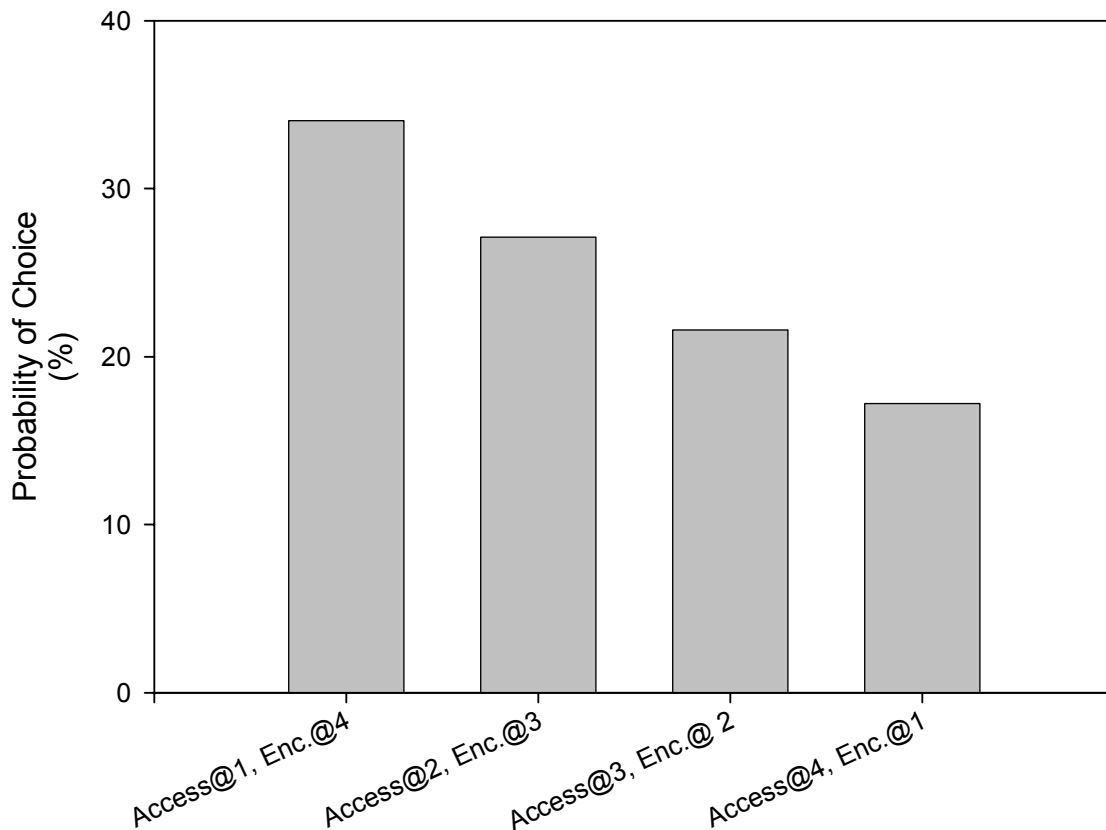
Visitor Preferences for Access-Encounter Scenarios for Jordan Pond

Figure 5: Visitor Preferences for Scenarios Demonstrating Decreasing Encounters with Increasing Access Restrictions (i.e., access at level one with encounters at level four vs. access at level two with encounters at level three vs. access at level three with encounters at level two vs. access at level four with encounters at level one) at Jordan Pond

The verbal protocol assessment provided additional insight into visitors' perceptions of these tradeoffs. The following excerpt from the verbal protocol transcripts demonstrates the support of Jordan Pond visitors for tradeoffs accepting higher encounters to keep the area more accessible:

> …I think access should be unlimited because they will take care of it themselves. If they see it's too many people, then they won't hike, they will come back another time, but to say that you can only have 75% of the people that want to hike – I don't think that is right. It is such a beautiful and unique place that…for example…if we want to go hike Jordan Pond, we should not be limited by the fact that there are other people here that want to do the same thing... (7/12/03, Group B)

Figure 6 illustrates preferences for tradeoffs among ecological impacts to the formal trail and levels of development on the trail. The results of the analysis demonstrate the difference in preferences for settings with low levels of trail development and high levels of ecological impacts to the trail compared to settings with higher levels of development and lower levels of ecological impacts. This hypothetical scenario is based on the assumption that increasing levels of development in a particular area will have a beneficial influence on the ecological conditions of trails.

As noted previously, it is predicted that visitors to JP would prefer no resource impacts on trails and moderate levels of site management. Further analysis of the tradeoffs among these variables, predicts that visitors to Jordan Pond would prefer higher levels of development (e.g., gravel and wood planking) to minimize or eliminate ecological impacts to trails. Because visitors preferred wood planking to gravel when holding all attributes constant, there is a slight decline in preference for gravel in the scenario test. Based on the verbal protocol and anecdotal information, visitors seem to like the gravel that is currently placed on half of the Jordan Pond trail, but do not wish to see that level of development along the entire pond trail, which may have influenced the lower ranking of gravel in the stated choice questions.
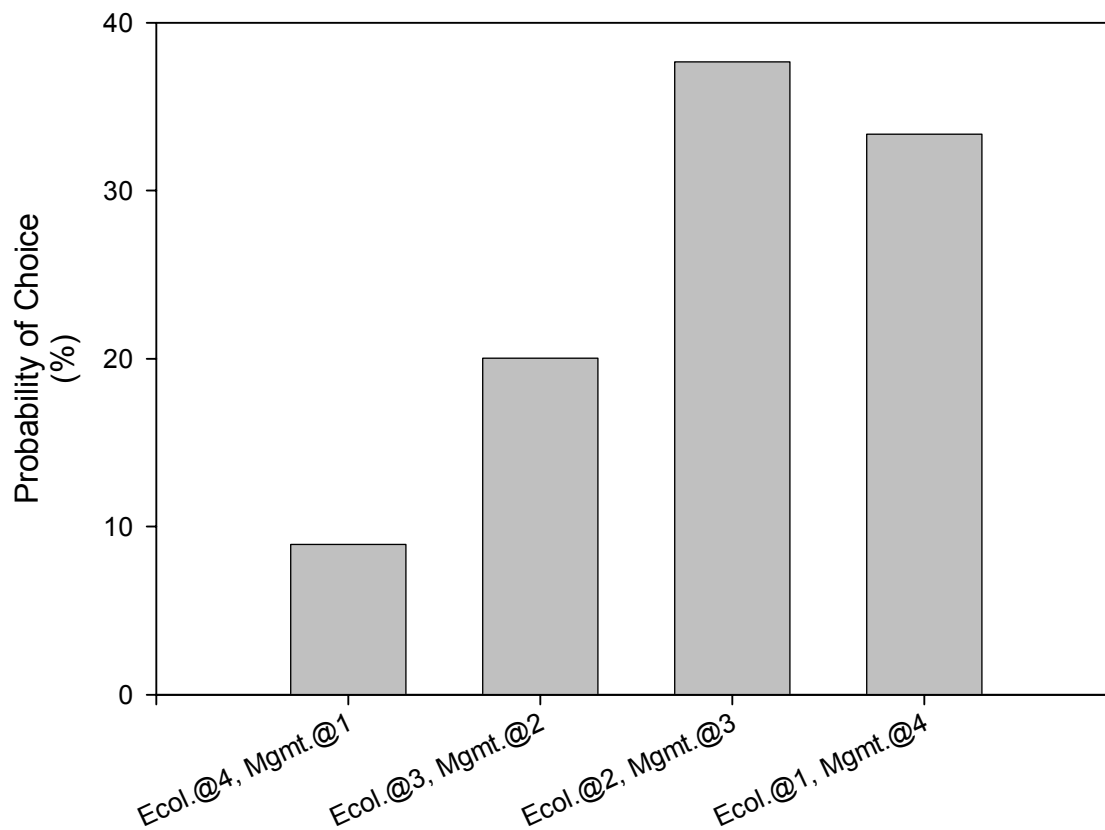
Visitor Preferences for Ecological-Management Scenarios for Jordan Pond

Figure 6: Visitor Preferences for Scenarios Demonstrating Improving Ecological Conditions with Increasing Development (i.e., ecological condition at level four with trail management at level one vs. ecological condition at level three with trail management at level two vs. ecological condition at level two with trail management at level three vs. ecological condition at level one with trail management at level four) at Jordan Pond

Although these data suggest that visitors prefer higher levels of development to ecological impacts, the verbal protocol assessment suggested a stronger relationship between visitors' preferences for higher development to improve access opportunities to a diversity of users. The following excerpt from the verbal protocol transcripts demonstrates the support of Jordan Pond visitors for tradeoffs accepting higher developments to improve the area's accessibility:

> … I don't agree that there should be no management constructed features along the trails because for some people that are not really nimble, it is difficult to get across puddles…I think this particular area should be made very user friendly because of the Jordan Pond

House…the refreshments are available, it is very pretty, it is a very easy walk… (7/13/02, Group J)

To further examine the concept of tradeoffs, each variable was compared to each of the other variables, in terms of how it might affect visitors' probability of choosing a hypothetical scenario (see Table 4). For each tradeoff comparison, each attribute was held at its highest level, level four, with all other attributes held at level one. The column in Table 4 titled choice probability summarizes the probability of a visitor choosing between two scenarios with the two attributes held at the highest level, and all other attributes held constant at level one. The odds ratio illustrates the degree to which visitors are more likely to choose one hypothetical scenario over the other.

Table 4: Visitor Preferences for Tradeoffs Between Each Social, Resource and Management Attribute at Jordan Pond

Hypothetical Scenario	Choice Probability	Odds Ratio	Preferred Scenario
Restricted Access vs. High Encounters	34% / 67%	2.0	High Encounters
High Development vs. Resource Impacts	63% / 38%	1.7	High Development
Restricted Access vs. High Development	33% / 67%	2.0	High Development
High Encounters vs. Resource Impacts	62% / 38%	1.6	High Encounters

The results of this analysis further demonstrate the preferences of visitors to JP for the various attributes when presented in terms of tradeoffs. For instance, although we know visitors to JP would prefer low levels of encounters, the analysis demonstrates that visitors are 1.6 times more likely to choose a hypothetical scenario with high visitor encounter levels over a scenario with high levels of ecological impacts to trails. Also, visitors are two times more likely to choose a scenario with high levels of encounters versus a scenario with highly restricted access. Further, visitors would prefer higher levels of development than highly restricted access. These results demonstrate that visitors have a clear aversion to restricted access to Jordan Pond, as well as resource impacts along the trail. The results also demonstrate that visitors are accepting of higher levels of encounters with other visitors and higher levels of development.

Discussion

This study expands traditional research of visitor preferences by considering tradeoffs among alternative setting attributes. The majority of visitor preference research has focused on

uni-dimensional social attributes, mostly related to the issue of crowding (Manning,Valliere, Wang, & Jacobi, 1999). Although this is thought to be an important issue, it is critical that planners and managers understand visitor preferences for both social and resource conditions, as well as for related management strategies. Further, previous research in the field of recreation management has suggested that asking visitors' preferences for various prescriptive conditions of the recreation setting results in support of the status quo (Cole, 2001). To be more proactive in managing recreation resources, it is critical that visitor preferences for setting conditions be approached from a more realistic perspective, in terms of tradeoffs. The use of stated choice analysis allows for a more holistic evaluation of social, resource and related management conditions, which can be integrated into decisions about how to manage recreation areas.

The choice model allows managers to gain a better understanding of the relative importance of social, resource and management attributes of various recreation settings. Managers can consider various combinations of these attributes when attempting to resolve specific problems or determine long-term desired conditions. The stated choice model allows for different management scenarios to be tested in order to predict possible public responses to various management alternatives. On particularly difficult or controversial issues, asking respondents to consider tradeoffs among recreation management alternatives may make the decision-making process for managers more defensible (Lawson & Manning, 2002).

The results of this stated choice study indicate that visitors to Jordan Pond are likely to accept high levels of encounters with other visitors to protect opportunities to access the area. In addition, Jordan Pond visitors would accept, and most likely support, high levels of development to protect resources as well as increase access opportunities for a diverse visitor population. Further, the verbal protocol provides evidence that visitors were considering the attributes and levels presented in the survey in terms of tradeoffs. Identification of these considerations provides more insight into what issues are important to respondents regarding the proposed recreation settings. This information would be useful during the planning process to further identify the desired character of a particular area. In addition, this information would be helpful to managers when contemplating alternative management strategies. For instance, the emphasis on safety and accessibility concerns during the verbal protocol by respondents at Jordan Pond provides additional support for the acceptability of higher levels of development in this particular

area. When working with the public, managers could address this concern in relation to any proposed management actions.

There are three major concerns with the implementation of this study. First, ideal implementation of the stated choice method should include visitor interviews or focus groups that would provide insight on appropriate variables to be used in the survey. This study relied on previous visitor survey data and conversations with park staff to develop the survey instrument rather than interviews or focus groups due to time and resource constraints. Second, the method of implementing public access restrictions may need to be defined in future stated choice surveys, because the method of implementing restrictions could affect visitor preferences for the concept of access restrictions. Finally, it is recommended that the stated choice method be used in combination with less structured public input methods. Based on anecdotal information collected by the author, it seems that some visitors, especially those that are frequent repeat visitors, felt the need for a more open forum to express their preferences for management of the area. Because the stated choice method presents close-ended questions, it would have been helpful to include open-ended questions or an interview format to allow respondents to express other feelings and place meanings associated with management of Jordan Pond.

Conclusion

This study illustrates the potential for the stated choice method to provide a more holistic approach to analyzing visitor preferences in recreation research (Lawson & Manning, 2002). One major advantage of the stated choice method is that respondents often find choosing among alternative scenarios as "the most natural and frequently experienced decision environment, compared to directly evaluating individual characteristics" (Opaluch et al., 1993, p. 47). Stated choice asks a person to consider the multiple attributes of a recreation setting and weigh tradeoffs among the attributes, which simulates the day-to-day decision making of park managers. Gaining insight on how visitors think these tradeoffs should be balanced provides one mode of support for defining desired conditions for management of an area, as well as supporting decisions on specific management actions.

However, it is important that the scientific value of this type of research does not mislead managers about the value-laden nature of decisions on appropriate use and management (Cole, 2001). The stated choice model does not include all of the attributes of a recreation setting that

may be relevant to a particular visitor (Schroeder & Louviere, 1999). The model does not, and probably cannot, include those personal qualities or meanings that people may associate with a site. However, the model can help managers have a general understanding of the importance of particular attributes that have been included in the model (Schroeder & Louviere, 1999). Stated choice should be used as one of many valuable tools in gaining a richer vocabulary on desired conditions and management alternatives for particular areas in a park (Manning, 2003).

The model developed in this study allows managers to evaluate visitor preferences for combinations of setting conditions that are not currently in place, but may offer a better alternative than the status quo (Lawson & Manning, 2002). In addition, management alternatives that may be considered during planning efforts may be tested by the model, allowing managers to gain some perspective on how visitors may react to certain alternatives (Lawson & Manning, 2002). The results of this study indicate that visitors to the more highly developed, highly visited areas of Acadia National Park, such as Jordan Pond, prefer natural settings with lower numbers of people, but are willing to accept higher levels of development on trails in tradeoff for freedom to visit these areas without restrictions.

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CHAPTER III. EXPLORING VISITOR PREFERENCES FOR SOCIAL, RESOURCE AND MANAGEMENTATTRIBUTES IN DIVERSE RECREATION SETTINGS.

Introduction

The complexity and conflict inherent in resource management for parks and protected areas is not a new concept, but over time there has been an increase in the intensity and public profile of debates over the "right" way to manage park resources. Managers of national parks are faced with the challenge of protecting resources and providing high quality visitor experiences.   Establishing a carrying capacity, or visitor capacity, is often seen as the answer to recreation management concerns such as reducing recreation crowding, user conflicts and resource impacts.

Extensive research and management experience over the last thirty years have revealed significant problems and deficiencies with application of the visitor capacity model to recreation management issues. The key concern was that the original visitor capacity model framed the problem of managing recreation in relation to managing levels of use. Research and management experience has revealed that use/impact relationships are highly complex with multiple factors influencing changes in resource conditions and the nature of visitor experiences (Frissel and Stankey, 1972). Further, Wagar (1974) and Wight (1998) have suggested that impacts from recreation use only become damage when there is some judgment about what conditions ought to be in a particular area – it is a value judgment, which should be defined by managers in collaboration with stakeholders. It is now more widely accepted that decisions about appropriate management of resources and visitor experiences are best achieved through identification and articulation of desired conditions.

Developing management prescriptions that define desired conditions by zones, implementing management actions to achieve desired conditions, and monitoring conditions have become the focus of recreation management for public lands. When seeking input for defining desired conditions, it is critical to acknowledge the relationship among the multiple dimensions of the recreation setting. These dimensions include the social conditions (e.g., visitor encounters), resource conditions (e.g., trail erosion), and management conditions (e.g., regulations employed, types and extent of site management) (Manning, 1999b). These

conditions are interrelated - an alteration in one variable can influence the others, resulting in the need to make tradeoffs (Lawson & Manning, 2001). For example, biophysical impacts from recreational activities can be minimized through site management techniques such as artificial surfacing, channeling use and facility development. However, the visual impact of such site management techniques can reduce the perceived naturalness of an area. Use limitation is an alternative strategy for minimizing recreational impacts that avoids the visual intrusion of "hardened" sites and developed facilities. However, reduction of use levels will result in fewer people being able to enjoy the resource. Defining these dimensions and understanding the relationship among them demonstrates great progress for the field of recreation management.

Often, the decision-making process regarding the management of recreation settings is left to the discretion of managers. The debates over desired social and resource conditions and related management strategies are steeped in value choices that should be made through a comprehensive process that considers stakeholders' preferences for conditions within particular settings (Krumpe & McCool, 1997; Manning, 1999b; Wight, 1998). Some research studies have been employed to identify visitor preferences for a range of management-related issues including impacts of crowding, resource damage, and management practices (Manning, 1999a). Traditionally, preference studies have asked respondents to rate a series of attributes that were considered to be important to the recreation experience (Roggenbuck, Williams & Watson, 1993), or focused on evaluating the appropriate condition of a single attribute (Manning, 1999a), such as the number of encounters with other visitors. These studies have not asked respondents to explicitly and simultaneously consider the range of related and competing issues that affect management decisions (Manning, 1999a, 2003). The typical preference study does not allow participants to respond to the *relative* importance and/or level of the attributes being evaluated because it does not ask them to consider the tradeoffs inherent in recreation management decision making.

This study expands the traditional uni-dimensional approach to studies of visitor preferences by utilizing stated choice analysis, a survey methodology that asks respondents to make a choice between two hypothetical situations with alternative configurations of several recreation setting attributes. The stated choice method is based on the theoretical framework of random utility, which suggests that respondents will seek to make rational decisions and therefore will select among alternative configurations of a multi-attribute good based on the

alternative that leads to the highest level of utility (i.e. most desirable or most preferable) (see Hanemann, 1984). In relation to this study, a visitor survey presented settings consisting of different descriptions of the resource, social and management conditions of a recreation area. In essence, visitors were asked to consider the multi-dimensional nature of their recreational environments (Lawson & Manning, 2002).

Visitor preference research has traditionally focused on wilderness and backcountry areas, providing little guidance for management in other recreation settings (Manning,Valliere, Wang, & Jacobi, 1999). Few public lands can be managed uniformly due to the diversity of resources, uses, users, conditions and public values (Haas, Driver, Brown & Lucas, 1987). Visitors come to national parks for very different and sometimes conflicting reasons, so providing a diversity of settings can provide a greater number of opportunities to meet visitor needs. Further, different resources have different abilities to accommodate visitor activities and require differing levels of resource management (National Park Service, 1997). By clearly defining desired conditions for different recreation settings, the park is proactive rather than reactive about what opportunities and management actions are appropriate. Without a clear understanding of appropriate and preferred management strategies in specific locations, it is possible that resources and visitor opportunities will decline to minimum conditions established for an entire area (Haas et al., 1987; Manning, 2003). Since the conditions and social values of an area can influence visitor perceptions and preferences for alternative management strategies, visitor studies need to examine preferences in context of different zones or management areas in a park.

This stated choice study expands traditional research of visitor preferences by providing a more comprehensive analysis through examining the preferences of visitors in three distinct areas of Acadia National Park, including Jordan Pond (JP) on Mount Desert Island (MDI), Isle au Haut (IAH), and Little Moose Island (LMI) off the Schoodic Peninsula. These areas have very different natural resource settings, visitor activities, use levels and facility developments.

The focus of this research was to explore an alternative empirical approach to generating visitor preference data that can assist the identification of desired conditions for different recreation settings. Specifically, this study was undertaken to achieve the following research objectives:

1.   Examine visitor preferences for various combinations of social, resource and
        management conditions.

2.   Identify differences among visitor preferences for social, resource and
        management conditions in different recreation settings.

Importance of Understanding Visitor Preferences in Recreation Planning and Management

Decisions on appropriate use are subjective judgments that are based on the multiple values of managing agencies, stakeholders and the general public. To better reflect the value judgments made during these decisions, there has been an increased focus on collaboratively defining what conditions should be maintained and what levels of impacts are acceptable in relationship to these desired conditions (Krumpe & McCool, 1997; Stankey, 1997; Wondolleck & Yaffee, 2000). If changes occur that interfere with the attainment of desired conditions, actions must be taken to minimize unacceptable impacts.

Deciding how to define desired social and resource conditions and management strategies is difficult since desired conditions are influenced by many factors, including agency policies, managers' personal values, physical resources of the area, and attitudes and expectations of potential visitors (Hendee, Stankey & Lucas, 1990; Krumpe, 2000; Manning, 1999b; Stewart & Cole, 2003). The definition of desired conditions becomes more difficult when there isn't obvious policy guidance suggesting the *appropriate* course for management. Further, the social, resource and managerial conditions that need to be defined are highly related – an alteration in one variable can influence the others, resulting in the need to make tradeoffs (Lawson & Manning, 2001, Manning, 2003).

The debates over appropriate social and resource conditions and related management strategies for public land resources are steeped in value choices that should be made through a process that gives full consideration to law and policies, current scientific knowledge and visitor and other stakeholders' preferences (Krumpe, 2000). It is often the visitor preferences that get overlooked in planning and day-to-day management due to the time and expense of collecting public input. Before developing desired conditions for a place, planners and managers need to find multiple means for assessing visitor preferences, based on the information needs of the planning process. Also, when seeking input for defining desired conditions, it is critical to acknowledge the relationship among the multiple dimensions of the recreation setting and seek

input that reflects these tradeoffs (Cole, 2001; Manning, 2003). Finally, it is important that when research on current visitors is available, the results are not cloaked in the "prestigious mantle of science," privileging this information over the input of other stakeholders (Stewart & Cole, 2003). Prescriptions for management need to be based on agency mission, legal mandates, purpose and significance of a place, and the input of all stakeholders, including visitors (Stewart & Cole, 2003).

Preferences for Social, Resource and Management Conditions in Different Settings

There is a common theme in the outdoor recreation literature that diversity in outdoor recreation settings and related recreation opportunities is important, leading to the provision of a variety of recreation areas in a region or the zoning of individual recreation areas by resource and social setting conditions. Visitors have different interests and motivations when visiting national parks, so providing a diversity of opportunities across a park, not necessarily in one attraction area, will allow visitors to self-select the experiences that most closely match his/her interests (National Park Service, 1997).

Further, it has been suggested that resource protection efforts benefit from zoning because resources have different tolerance levels to visitor use impacts in various areas throughout a park. For example, highly sensitive resources (e.g., cryptobiotic soils) might tolerate little, if any, visitor use, while other resources (e.g., grasses) may accommodate higher levels and different types of use (National Park Service, 2000). Further, some resources may need varying forms of management in different areas of the park. For example, some vegetation may not be fire tolerant (e.g., saguaro cactus), requiring active fire suppression to maintain the integrity of the resource system. Other vegetation types (e.g., giant sequoia forests) may be dependent on fire for propagation, requiring prescribed burn activities to protect the resources. Zoning recognizes that there may be smaller subunits or zones within a park, each with different management needs regarding the resources and social setting characteristics. Zoning is defined as differences in prescribed setting conditions and prescribed management for different sections of a protected area (Haas et al., 1987).

Different combinations of resource and social settings can create various recreation opportunities to meet the needs of a diverse public. Understanding the nuances of appropriate management for different settings is critical, since "it is the setting that recreationists seek, use

and impact; it is the setting that managers manipulate, modify, or influence; it is the setting that is allocated to one dominant use or another" (McCool, Stankey & Clark, 1985, p. 2). Previously, park managers and planners did not specifically define the visitor experiences that were most appropriate in different areas in a park. The response to increasing use levels and demands for new activities was increasing infrastructure (Clark & Stankey, 1979). Eventually, it was realized that reactive management actions were changing the character of recreation settings and the nature of the visitor experience (National Park Service, 1997).

The assertion that a systematic approach is needed to defining a diversity of desired conditions in parks led to the development of multiple classification or zoning systems (Manning, 1999b). One of the highly developed classification systems that received a great deal of attention and use is the Recreation Opportunity Spectrum (ROS). ROS was developed based on the premise that diversity was an important characteristic of any recreation system and that managing for diversity was crucial for social equity (Clark & Stankey, 1979). ROS focused on the situational attributes (e.g., access, use density, etc.) that comprise recreational opportunities. The attributes described in ROS are arranged in configurations that suggest standard categories of opportunities, ranging from modern to primitive settings (Manning, 1999b). The United States Forest Service and the Bureau of Land Management have adopted ROS as part of recreation planning.

The National Park Service (NPS) has also adopted the concept of zoning for diversity in resource management and social setting conditions. However, the NPS' approach to zoning is less structured and formalized than the ROS framework. The management policies of the NPS call for desired conditions of park resources and visitor experiences to be based on the purpose and significance of the park, and be individually developed based on analysis of the constraints and opportunities of individual resources and setting conditions (NPS, 2000). Another difference in the NPS approach is that NPS zoning includes discussion of desired conditions for resources beyond those affected by visitor use.

Relationships among visitor preferences for social and resource conditions and management strategies to recreation settings have received little empirical testing (Manning, 1999b). One study that did examine use level preferences for different river types, from primitive torrent to urban meander, found differences in desired use levels amongst the distinct settings (Manning & Ciali, 1981). A recent study that examined backpackers' preferences for

encounters along trails in the three distinct settings of Grand Canyon National Park found that visitors differentiate between management zones (Cole & Stewart, 2002). The study found that hikers think encounter frequencies should vary substantially among zones, and the hikers' stated preferences for encounters matched managers' desired encounter levels in the various zones. The study found that visitors in the wilder, less developed zones of Grand Canyon more often stated that encounters mattered and provided a lower quantitative standard than visitors to more developed zones. In addition, the study examined both pre-trip and post-trip encounter preferences and established that acceptability standards were similar, suggesting that the standards were more than just visitors guessing at the concept of acceptable encounter levels (Cole & Stewart, 2002). More research is needed on the variation of visitor preferences for conditions in different recreation settings.

The Stated Choice Method

This study examines visitor preferences for conditions in different settings through the use of the stated choice method. Stated choice analysis is an empirical method based in random utility theory that was originally developed as a technique in marketing research to measure the psychological judgments of consumer preferences (Green, Tull & Albaum, 1988). The method has also been applied to analyze public preferences and values towards multiple-objective decisions in natural resource management. It is a useful tool for aiding decision making that involves tradeoffs between costs and benefits that are not represented efficiently in market transactions. As noted by Dennis (1998), asking the public to make choices among alternatives is similar to the type of decisions that managers must make in deciding on the appropriate mix of recreation setting conditions. Louviere and Timmermans (1990) noted that one of the strengths of stated choice analysis is its predictive ability, providing managers with insights about how the public may react to recreation management decisions. It can also provide information on preferences for arrangements of resources, facilities, and/or services (Louviere & Timmermans, 1990). Stated choice and other visitor preference measurement approaches have experimented with alternative evaluative dimensions including preference, acceptability and tolerance for various levels of different attributes (Manning et al., 1999). This study examined preferences by asking respondents to choose the setting scenario they would "prefer" in a particular area.

The stated choice method is similar in theory to criteria-ranking and other structured

decision-making mechanisms often used by policymakers and public agency decision makers. When making decisions about appropriate alternatives for management, agency decision makers have tended to favor the use of "objective" criteria defined and ranked by a technical team (Opaluch, Swallow, Weaver, Wessells & Wichelns, 1993). Often, decision-scoring mechanisms are developed that allow each alternative management scenario to be ranked based on its attributes. An example of an objective scoring mechanism includes the National Park Service's use of Choosing By Advantages (CBA) to identify a preferred management alternative for a park. CBA ranks alternatives based on a variety of criteria, including environmental impact analysis and cost estimates (NPS, 1998). The stated choice method is closely aligned to these types of structured ranking methods. By recording a large number of visitor choices among alternative management scenarios, numerical weights for the attributes are estimated and can be used to rank the scenarios based on the configuration of the attributes (Opaluch et al., 1993). While this is still a very subjective process, it may be considered an improvement over the sole use of expert defined ranking mechanisms since it includes a large polling of public preferences.

Study Area and Methods
Acadia National Park

Established as Lafayette National Park in 1919 and renamed to Acadia National Park in 1929, this NPS unit was the first national park east of the Mississippi River. Today, the National Park Service manages approximately 36,000 acres of Atlantic Coast shoreline, granite mountains, mixed hardwood and spruce/fir forest, mountains, lakes, and several offshore islands. Almost 30,300 acres is included on Mount Desert Island. Isle au Haut includes 2,728 acres, while Little Moose Island is about 34 acres. Acadia hosts over 3 million visitors a year and primary recreation activities include hiking, bicycling, camping, sightseeing, picnicking, photography and nature observation.

Although many attributes of the various recreation settings in Acadia are important to visitors, the historical significance of trail development in the park makes trail management particularly difficult. Further, hiking and bicycling on trails are some of the most popular activities in the park. For these reasons, this study focused on visitor preferences for attributes related to the social and resource conditions of trail systems in the park in different settings.

Mount Desert Island is the most developed area of the park and receives the highest level of visitation. The trails of MDI originated during three distinct eras of trail building, which define the historical character of the system (NPS, 2002). To date, there are approximately 111 miles of trails on MDI. Most of these trails are highly maintained, including the use of gravel, paving, rock steps, culverts and bridging. Jordan Pond was chosen as the representative site on MDI due to its high level of trail development, visitation levels, and visitor amenities. JP is one of the first sites that visitors travel to when they enter the park.

Isle au Haut is distinct in the setting it offers visitors. Recreation facilities are more primitive and remote than on MDI. There are currently 18 miles of formal trails on IAH, and use levels are much lower than on MDI. There has always been a strong desire to manage the island as a "wild area" with minimal facilities and low levels of use (Jacobi, 2002). Special legislation that addressed the management and use levels on IAH was passed in 1982.   This led to a visitor capacity study that, based on the resource and social conditions on IAH trails, suggested that visitor use was at capacity. The trails on IAH are maintained and marked, but in a more primitive style than on MDI.

Little Moose Island is located off the tip of the Schoodic Peninsula. It offers yet another setting for recreation opportunities. Currently, there are no designated trails on LMI. Visitors must cross rocks exposed only at low tide to gain access to the island. On the island, a few visitor-created trails are apparent, but there is no signed trail system. There are also no interpretive materials or park rangers on the island. The trails on LMI are not actively maintained, although some work has recently been done to eliminate unnecessary trails.

Selection of Attributes and Levels

As summarized by Manning (1999b), research has been conducted on identifying the ecological, social and management attributes that may contribute to the nature of recreation experiences. Based on a literature review, including park documents, and review of recent survey research done at both Isle au Haut and the Schoodic Peninsula, numerous attributes were considered to define the social, resource and management conditions related to trail systems in Acadia National Park. Four attributes were selected that were considered to be managerially relevant and likely to influence recreation site preferences. The social setting is represented by encounters with other visitors; the resource setting is represented by the condition of the formal

trail in terms of widening due to wet soils; and the management setting is represented by levels of public access and levels of trail development. Four levels were provided for each attribute, representing the range of conditions likely to be encountered in the three park settings. These levels were based on discussions with other researchers and park staff (see Table 5).

Table 5: Acadia Recreation Setting Attributes and Levels used in the Stated Choice Survey

Social Conditions
    Level of Encounters
     1   Visitors encounter no other groups during a hike.
     2   Visitors encounter up to 5 other groups during a hike.
     3   Visitors encounter up to 10 other groups during a hike.
     4   Visitors encounter up to 20 other groups during a hike.

Resource Conditions
    Ecological Condition of Official Trail *
     1   Trails show no signs of widening or secondary trails.
     2   Visitor use on trails with wet soils has caused a slight amount of trail widening.
     3   Visitor use on trails with wet soils has caused a moderate amount of trail widening.
     4   Visitor use on trails with wet soils has caused extensive trail widening and formation of secondary trails around wet areas.

Management Conditions
    Public Access
     1   The number of people allowed to hike in this area is not limited.
     2   The number of people allowed to hike in this area is limited – around 75-80% of interested visitors are able to gain access.
     3   The number of people allowed to hike in this area is limited - about half of interested visitors are able to gain access.
     4   The number of people allowed to hike in this area is limited – around 25-30% of interested visitors are able to gain access.
    Trail Management *
     1   There are no management-constructed features along trails (e.g., stepping stones, wood planking, gravel).
     2   Stepping stones are placed along sections of trails.
     3   Wood planking is placed on sections of trails.
     4   Gravel is placed on sections of trails.

* Portrayed in the survey with these narrative statements, as well as photos.

Experimental Design

Since each attribute was assigned four levels, a full factorial design would have produced a total of 4^4 (256) hypothetical recreation settings. This large number of settings was too many choice sets for a survey participant to evaluate. An experimental design called fractional factorials was used to produce a smaller subset of site descriptions. The factorial design

combined the four recreation setting attributes at varying levels to result in 32 paired comparisons blocked into four questionnaire versions. Each questionnaire version included eight pairwise comparisons. An example of a typical Acadia recreation setting comparison is presented in Figure 7. Respondents were asked to choose either Recreation Setting A or Recreation Setting B.

Recreation Setting A	Recreation Setting B
The number of people allowed to hike in this area is not limited.	The number of people allowed to hike in this area is limited - around 25-30% of interested visitors are able to gain access.
Visitors encounter up to 5 other groups during a hike.	Visitors encounter up to 5 other groups during a hike.
Visitor use on trails with wet soils has caused extensive trail widening and formation of secondary trails around wet areas. (See photo below)	Trails show no signs of widening or secondary trails. (See photo below)
There are no management-constructed features along trails (e.g., stepping stones, wood planking, gravel). (See photo below)	Wood planking is placed on sections of trails. (See photo below)

Figure 7: Example of a Recreation Setting Comparison used in the Stated Choice Survey

Survey Administration

Surveys were administered July 1-August 15, 2002, generally between 10 am to 6 pm on both weekend and weekdays. The days and times for sampling visitors to LMI varied based on tidal patterns. The stated choice survey was conducted using self-administered questionnaires (see Appendix A).

During the survey, respondents were presented with a series of eight pairs of alternative settings defined by four attributes. For each pair, respondents were asked to choose the setting alternative they preferred. A small number of questions were included at the end of the questionnaire to gather information about visitor characteristics, visitors' trip experiences, and visitors' assessments of the stated choice questions.

On average, there was an 80% response rate at the three survey locations, resulting in a total of 588 completed stated choice surveys. There were 36 survey days at IAH and a total of 189 surveys completed, with the highest response rate of the three locations at 94.5%. LMI had the second highest response rate at 84.8%, with 19 survey days and 196 surveys completed. Finally, 203 surveys were completed at Jordan Pond over eight survey days, with a 66.7% response rate.

Stated Choice Model

Outcomes of stated choice models are explained using the well-established decision-making framework of random utility theory (Hanemann, 1984; Opaluch et al., 1993). This theory assumes that the attributes of alternatives relevant to a given choice are evaluated in terms of the utility they provide the respondent. Further, the utilities associated with each of the attributes are combined into an overall utility for each alternative, after which the alternative with the highest overall utility is selected (Lindberg, Dellaert & Romer Rassing,1999). For this study, the individual would choose recreation setting A over recreation setting B for an area in Acadia National Park if

$$U(X^A) > U(X^B)$$

where U(i) is the individual's utility associated with Acadia recreation setting $i(i$=A,B), and X^i is a vector of variables describing the attributes of Acadia's recreation setting under alternative i

(Opaluch et al., 1993). Further, the random utility theory establishes that the individual's utility is composed of both a measurable component and unobservable component (Hanemann, 1984). The unobservable component may consist of measurement error, omitted explanatory variables, and random choice behavior (Dennis, 1998). In formula, the random utility model is expressed as follows:

$$u(X^A) + e^A > u(X^B) + e^B$$

where $u(i)$ is the measurable component of the individual's utility that is estimated empirically and used to develop recreation setting scores and e^i is the unobservable component of utility (Opaluch et al., 1993). The recreation setting scores are based on the utility coefficients for all attribute levels, which are estimated using multinomial logit regression analysis procedures based on maximum likelihood estimation (Opaluch et al., 1993; Schroeder & Louviere, 1999). In short, the utility coefficients derived for each of the attributes, which can also be considered numerical weights, are used to score alternative setting choices.

The final step of the analysis is to use the recreation setting scores to determine the probability that a randomly selected individual would choose a particular recreation setting from among the pair of alternatives with given attributes (Opaluch et al., 1993). This probability can be expressed as

$$P^A = Pr(\theta < D^u)$$

where P^A is the probability that the individual would prefer alternative A over alternative B; θ is the difference in the unobservable components of the individual's utility (e^A-e^B) and D^u is the difference in the measurable components of the individual's utility $\{u(X^A)$-$u(X^B)\}$ (Opaluch et al., 1993). This information can be used to test hypothetical management scenarios that may be considered during planning efforts or day-to-day decision making.

To estimate the probability of support for recreation setting A over setting B, a statistical procedure called the logit transformation is used (see Hanemann, 1984; Opaluch et al., 1993; Schroeder & Louviere, 1999). The logit transformation converts each recreation setting's utility into a choice probability, a number between zero and one (Schroeder & Louviere, 1999). If the probability were zero, than the visitor would never choose that recreation setting. If the

probability were one, he/she would always choose that setting. Therefore, the probabilities of all of the setting options in the choice set must sum to 1, given that each person must choose an option from the set (Schroeder & Louviere, 1999). In summary, the setting scores allow for prediction of the proportion of individuals that would choose each recreation setting for a particular area in a hypothetical referendum based on the attributes of the choice settings (Opaluch et al., 1993).

Results

On average, the demographic information for respondents across the three locations was relatively similar, except for outdoor recreation activity and experience with the survey area. As summarized in Table 6, average age is almost the same across all three locations at 57 years of age, and the average level of education was also roughly the same, with most respondents having completed at least a master's degree. Other variables regarding visitation and outdoor activity varied among the three locations. Repeat visitation to the study area was highest at Little Moose Island with an average of 15 times in a lifetime, versus four times to Isle au Haut and six times to Jordan Pond. This data is supported by the anecdotal information collected at survey locations by the survey attendants. The majority of visitors to Little Moose Island were proud to note that they had been coming for many years, including multiple generations. Regarding levels of hiking activity in the last 12 months, the highest responses were for visitors to Little Moose Island with an average of 13 hikes in the past year, followed by Jordan Pond with an average of almost nine hikes and Isle au Haut with an average of almost eight hikes in the last year.

Over 17 percent of respondents at LMI live within 10 miles of the study site and over 32 percent were from Maine. In contrast, 6.5 percent of JP respondents live within 10 miles of the study site and 14 percent were from Maine, and 4.5 percent of IAH respondents live within 10 miles and 13 percent were from Maine. At all three study sites, the majority of respondents that were not from Maine were from other Northeastern states such as Massachusetts, New York, Pennsylvania and Connecticut.

Table 6: Summary of Demographics for Respondents at all 3 Survey Locations

Demographic variable	Little Moose Island			Isle Au Haut			Jordan Pond		
	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
Times visited this area of Acadia	189	14.98	37.92	179	4.35	18.52	194	6.01	15.36
Times hiking in 12 months	190	13.29	22.35	176	7.76	12.27	190	8.73	17.42
Year of birth	192	1955	13.55	177	1957	12.57	201	1956	12.44
Level of education	192	17.42	2.82	177	17.23	2.67	195	17.17	2.82

Preferences for Social, Resource and Management Conditions

Examining the coefficient estimates for the setting attributes at all three study sites can allow for inferences about visitor preferences for each attribute. The coefficient estimates for the setting attributes at all three study sites, along with their standard errors, Chi-Square values and p-values are presented in Table 7.

Most of the coefficients are significantly different than zero at the 5% level, except Ecological Condition of the Official Trail at level 3 for Little Moose Island and Isle au Haut. In addition, Ecological Condition at level 2 and Trail Management at level 1 were not statistically significant for Little Moose Island. A negative value on the coefficients implies that an increase in the associated attribute leads to a reduction in the probability that the recreation setting would be chosen by a respondent (Opaluch et al., 1993). For example, the negative coefficient on the public access indicator for all three locations indicates that if access is restricted at any of the locations, the probability of a visitor choosing that recreation setting drops. The public access and level of encounters attributes are ordinal variables, so if the attribute is increased by one level (i.e. Level 1 to Level 2), the log utility is changed by the coefficient estimate value. The ecological condition and trail management attributes were nominal variables, so coefficient estimates were evaluated for each level independently. The overall fitness of the model is supported by the results of the Chi-Square Goodness of Fit test, with p<.0001 for all three locations.

Table 7: Coefficient Estimates from the Stated Choice Survey for Recreation Setting Attributes at LMI, IAH & JP

| | | Little Moose Island | | | |
| | | Coefficient | Standard | | |
Variable	DF	Estimate	Error	Chi-Square	p-value
Public Access	1	-0.141	0.035	16.256	**0.000**
Level of Encounters	1	-0.426	0.040	115.575	**0.000**
Ecological Condition 1	1	0.458	0.070	42.644	**0.000**
Ecological Condition 2	1	0.008	0.071	0.012	0.912
Ecological Condition 3	1	-0.005	0.066	0.005	0.945
Ecological Condition 4*		-0.461	-	-	-
Trail Management 1	1	-0.131	0.076	2.993	0.084
Trail Management 2	1	0.435	0.067	41.919	**0.000**
Trail Management 3	1	0.205	0.067	9.426	**0.002**
Trail Management 4*		-0.508	-	-	-

* Coefficients for the excluded level of the attribute were not estimated by the statistical model, but rather were calculated as the negative sum of the coefficients on the other three levels of the corresponding attribute.

| | | Isle Au Haut | | | |
| | | Coefficient | Standard | | |
Variable	DF	Estimate	Error	Chi-Square	p-value
Public Access	1	-0.109	0.036	9.431	**0.002**
Level of Encounters	1	-0.390	0.041	90.638	**0.000**
Ecological Condition 1	1	0.354	0.070	25.332	**0.000**
Ecological Condition 2	1	0.204	0.074	7.639	**0.006**
Ecological Condition 3	1	-0.010	0.068	0.023	0.880
Ecological Condition 4*		-0.548	-	-	-
Trail Management 1	1	-0.309	0.077	16.121	**0.000**
Trail Management 2	1	0.234	0.068	11.890	**0.001**
Trail Management 3	1	0.618	0.072	74.590	**0.000**
Trail Management 4*		-0.543	-	-	-

* Coefficients for the excluded level of the attribute were not estimated by the statistical model, but rather were calculated as the negative sum of the coefficients on the other three levels of the corresponding attribute.

| | | Jordan Pond | | | |
Variable	DF	Coefficient Estimate	Standard Error	Chi-Square	p-value
Public Access	1	-0.360	0.036	100.233	**0.000**
Level of Encounters	1	-0.132	0.036	13.714	**0.000**
Ecological Condition 1	1	0.470	0.065	52.852	**0.000**
Ecological Condition 2	1	0.220	0.069	10.178	**0.001**
Ecological Condition 3	1	-0.279	0.064	18.948	**0.000**
Ecological Condition 4*		-0.411	-	-	-
Trail Management 1	1	-0.478	0.070	46.254	**0.000**
Trail Management 2	1	0.194	0.066	8.730	**0.003**
Trail Management 3	1	0.327	0.067	23.890	**0.000**
Trail Management 4*		-0.043	-	-	-

* Coefficients for the excluded level of the attribute were not estimated by the statistical model, but rather were calculated as the negative sum of the coefficients on the other three levels of the corresponding attribute.

The coefficients for the recreation setting attributes allow for inferences about the relationships of the attributes among the three settings. As mentioned, increasing access restrictions (the public access attribute changing from level 1 to 4) has a negative influence on the probability of respondents' choices at all three settings, as seen with the negative coefficient. Increasing levels of encounters between visitors and increasing ecological impacts also has a negative influence on the probability of respondents' choices at all three settings. Increasing development had a varied effect at the three locations. Isle au Haut and Jordan Pond respondents both preferred wood planking to the other management treatments. Little Moose Island respondents most preferred stepping stones, which may be considered the most natural of the trail management options. Gravel, although not a favorite of respondents at any location, was most acceptable to respondents at Jordan Pond.

Differences in Preferences for Recreation Setting Attributes among Zones
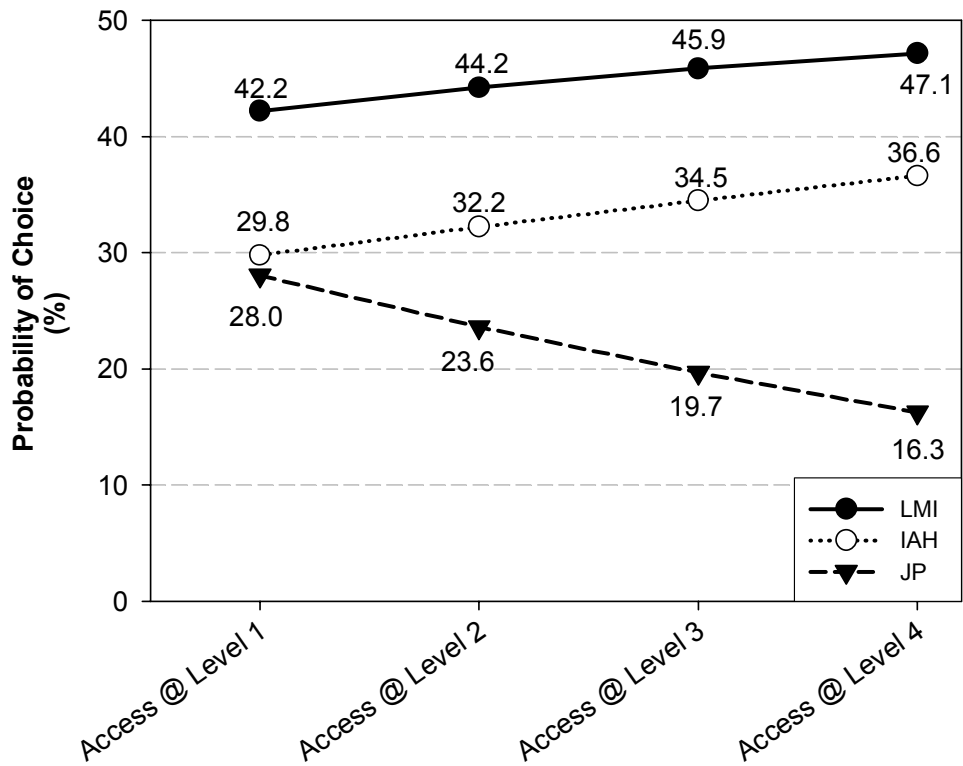
To further examine the effect of the varying levels of attributes on respondents' preferences for recreation settings, the model was used to translate recreation setting scores into predicted proportions of visitors to Acadia that would vote for each recreation setting in a hypothetical referendum based on the setting attributes (Opaluch et al., 1993). Most

management decisions for public lands must be made in the public arena, so it is helpful to examine the results of the data in terms of potential public support for particular management strategies. In addition, to focus the analysis on how preferences for recreation setting attributes vary among zones, the analysis compared the relationship of the predicted proportion of visitors that would vote for each hypothetical recreation setting among the three survey locations.

First, the relationship of the effect of changes in the individual attributes among the three setting locations can be analyzed by comparing the predicted proportions of visitors that would choose each recreation setting, holding all but one attribute at a constant level. As an example, Figure 8 shows that increasing access restrictions (the public access variable increasing from level 1 to 4, holding all other variables constant) has a more pronounced negative effect on the probability of choice of a recreation setting for visitors to Jordan Pond than Little Moose Island. For instance, at Public Access level 4, visitors to Little Moose Island are much more likely to accept the restriction than respondents at Jordan Pond, even though increasing access restrictions had a negative influence on preferences at all three locations.

Another example compares the effect of increasing visitor encounters across the three survey locations. As previously noted, the coefficients resulting from the stated choice model show that increasing encounters with other visitors has a negative influence on respondent choice for all three locations. However, examining the probability of choice for recreation settings with various levels of visitor encounters across the three locations allows for the level of importance of visitor encounters to be compared. As seen in Figure 9, increasing encounter levels would be more acceptable to visitors at Jordan Pond than Little Moose Island or Isle au Haut. As visitor encounter levels increase, it is predicted that there is a higher negative impact on the probability that visitors to Little Moose Island would choose that recreation setting compared to visitors at the other locations.

Figure 8: The Probability of a Visitor Choosing a Recreation Setting with the Access Variable at Levels 1-4 Compared Across the Three Survey Locations
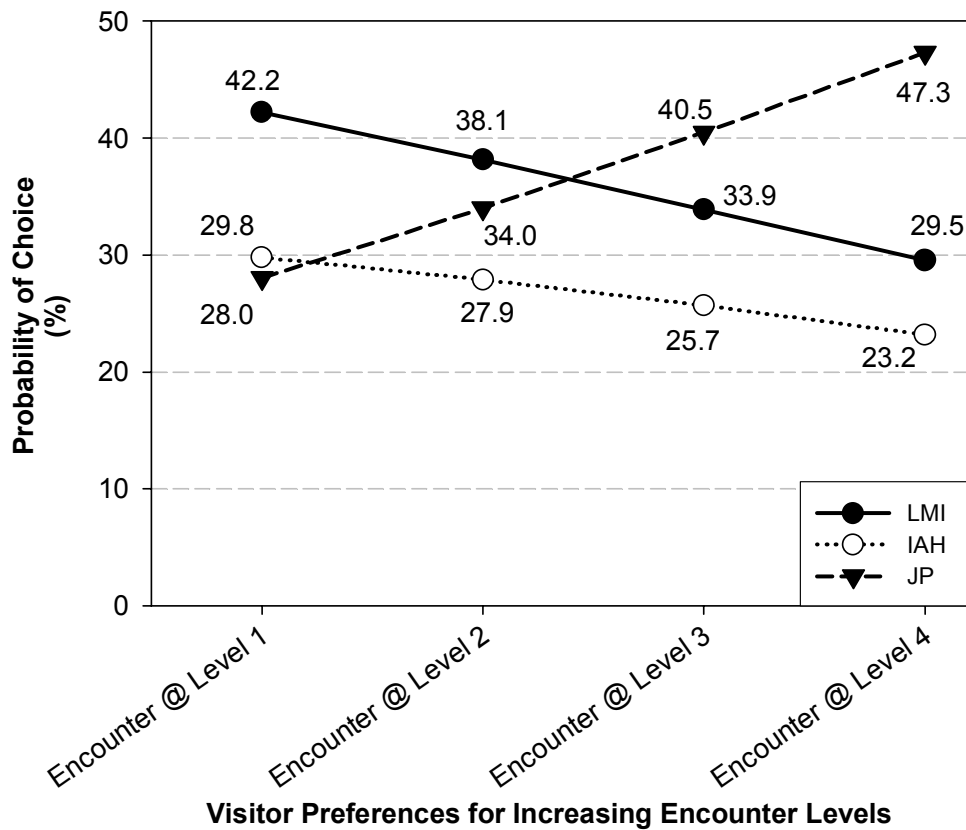
Figure 9: The Probability of a Visitor Choosing a Recreation Setting with the Encounter Variable at Levels 1-4 Compared Across the Three Survey Locations

Another demonstration of the applicability of the stated choice method for planning and management decision making included testing scenarios of different management regimes that included varying levels of multiple attributes. As an example, two hypothetical management scenarios were considered (see Table 8). The first will be referred to as the restricted access scenario and the second will be considered the development scenario. For the restricted access alternative, the public access attribute was held at it most restrictive level (level 4), and encounters and level of trail management were at their lowest level (level 1). For the development scenario, the trail management attribute was at its highest level (level 4), and public access was at its least restrictive (level 1) and the level of encounters was held at the mid level (level 3). The ecological condition variable was held at level two for both scenarios. The basis of the comparison between the restricted access scenario and the development scenario is

visitors' evaluations of the tradeoffs between managing recreation settings by controlling access versus increasing development.

Table 8: Preferences for Restricted Access and Development Scenarios across the Three Survey Locations

Scenario	Little Moose Island	Isle au Haut	Jordan Pond	Location Favored
Restricted Access	41%	42%	17%	LMI & IAH
Development	18%	22%	60%	JP

The analysis predicts that, in a hypothetical referendum, both visitors to Little Moose Island and Isle au Haut are more likely to pick the restricted access scenario than would visitors to Jordan Pond. Respondents at Jordan Pond are much more likely to choose the higher development scenario than visitors to Little Moose Island and Isle au Haut. The low levels of encounters that may result from restricted access might be the preferred aspect of this scenario for visitors to LMI and IAH, as demonstrated in the results of the relative importance of this attribute to respondents at these locations. In addition, JP visitors' preference for higher levels of development may be attributed to the increase in opportunities that would result for a diversity of visitors. Although these scenarios represent extreme management situations, the results continue to demonstrate a distinct difference in preferences for management in the three settings, suggesting that public support may vary for various management alternatives by zone.

Another set of management scenarios that were tested focused on the preferences for a low management presence scenario, with no restrictions on access (level 1) and no formal trail management (level 1), versus a high management presence scenario, with the highest level of access restrictions (level 4) and the highest level of development on trails (level 4) (see Table 9). In the low management presence scenario, it was assumed that there might be high levels of visitor encounters (level 4) and high levels of resource impacts on trail (level 4). The opposite was assumed for the high management presence scenario, with low levels of visitor encounters (level 1) and low resource impacts on trails (level 1).

Table 9: Visitor Preferences for Low and High Management Presence Scenarios across the Three Survey Locations

Scenario	Little Moose Island	Isle au Haut	Jordan Pond	Location Favored
Low Management Presence/High Impacts	29%	23%	48%	JP
High Management Presence/Low Impacts	37%	33%	29%	LMI

The results indicate that in a hypothetical referendum it is expected that visitors to Jordan Pond would be more accepting of the high impacts resulting from a low management presence than visitors to the other locations. Based on the information presented from the relative importance of each of the attributes, it is likely that the JP visitors' strong preference for unrestricted access and LMI and IAH visitors' strong aversion to high encounter rates were the main influence on the result of this scenario test. Further, the high management presence scenario would be most accepted or preferred at Little Moose Island, although the difference in preferences is not as great as seen for the low management presence scenario test. Again, it is likely that JP visitors' strong aversion for restricted access and LMI and IAH visitors' strong aversion to high levels of development influence the mutual level of preference/acceptance of this scenario. In short, it is likely that the high levels of the two management strategies (restricted access and level of trail development) would cause these scenarios to be similarly rated by visitors across the three locations.

Discussion

The use of stated choice analysis allows for the consideration of multiple conditions of recreation settings. This study includes a set of social, resource and management conditions of three distinct recreation settings in Acadia National Park to aid decisions about how to manage various zones in the park. The results of the analysis have many implications for the field of recreation research, and public land planners and managers. The results of this study show that visitors have preferences for different recreation setting attributes in particular areas, indicating that some management actions may only be appropriate in particular areas or sites.

For management purposes at Acadia National Park, this study provides information about the relative importance of these target social, resource and management conditions among three locations of the park. For example, study results indicate that visitors to the Jordan Pond area of

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Acadia National Park are more in favor of development options for managing trails than visitors to the other locations. Visitors to Little Moose Island and Isle au Haut expressed stronger support for keeping encounter rates low and trail conditions primitive than visitors to Jordan Pond. Finally, all visitors would prefer low levels of resource impacts. In summary, it is expected that visitors to Acadia National Park are willing to tradeoff unlimited access for less development in more primitive areas of the park. However, in areas that accommodate a more diverse visitor population, access is a high priority and higher development is seen as a positive management action. These differences for preferences between zones highlights the need to fully understand management issues and select management strategies that are both effective as well as acceptable to visitors that may frequent a particular area of the park.

For planning purposes, the study provides empirical support that visitors have preferences for resource, social and management characteristics that vary by zones; so zoning public lands may help provide a diversity of setting opportunities that will better meet the public's needs and interests. This research suggests there are distinct differences in preferences, which may influence public support for prescribed desired conditions in particular areas of the park. During the planning process, a stated choice survey could be one form of visitor use data collection. The stated choice visitor survey would provide information on preferences for various setting conditions and related management strategies. Additional questions could be added to the survey to provide information on visitor use patterns and characteristics. As a result of data collection, planning staff would be more informed of visitor priorities for different management issues in specific areas of the park. However, it is critical that any visitor survey data be used in conjunction with other possible data sources and topics, such as legal and policy mandates, agency mission, regional supply and demand, resource analysis, and local, regional and national stakeholder involvement, when developing management prescriptions (Manning, 2003; Stewart & Cole, 2003).

Finally, this study continues to illustrate the potential for the stated choice method to provide a more holistic approach to visitor preference research (Lawson & Manning, 2002). Stated choice asks a visitor to consider the multiple attributes of a recreation setting and weigh tradeoffs among the attributes, which simulates the day-to-day decision making of park managers. Gaining insight on how visitors think these tradeoffs should be balanced provides one mode of support for management decision making. However, it is important that the scientific

value of this type of research does not mislead managers about the value-laden nature of decisions on appropriate use and management (Cole, 2001; Stewart & Cole, 2003). Stated choice is one of many valuable tools to be used in gaining a richer vocabulary on appropriate conditions and management alternatives for particular areas in a park.

This technique and its application in this study are not without some limitations. Visitor preference surveys, including stated choice studies, can provide us with quantitative, generalized data, but these data fail to capture the range of human perceptions and preferences for management of the landscape. However, when combined with other methods of input, stated choice modeling can complement and expand the depth of knowledge during planning processes and long-term monitoring. The ideal implementation of the stated choice method would include visitor interviews or focus groups that would provide insight on appropriate variables to be used in the survey. This study relied on previous visitor survey data and conversations with park staff to develop the survey instrument rather than interviews or focus groups due to time and resource constraints. Further, sharing of the quantitative and qualitative data with focus groups, park staff, and public work groups would allow the results to be interpreted in relation to the values, meanings and issues of a park. The opinions of current users gathered during this research effort must be complemented by other legitimate sources for evaluative judgments such as decision makers, experts, interest groups and the general population (Manning, 2003; McCool & Cole, 1997; Stewart & Cole, 2003).

Conclusion

Decisions about appropriate management of public lands are extremely complex and steeped in value choices. It seems appropriate to encourage multiple sources of information to assist in the difficult process of prescribing desired conditions for a park and the day-to-day management of the park. Stated choice analysis provides one technique for considering the relationship of various conditions that may influence the nature of visitor experiences and resource protection efforts.

Stated choice methodology is not a panacea for planning and management information needs. However, it is an improvement over traditional preference studies by explicitly considering the relationship among social, resource and management conditions of public lands. This study illustrates the kind of information that can be provided to planners and managers who

may be developing management plans, or making day-to-day decisions that can have long-term effects on the character of a place. Stated choice can be a valuable tool when used in conjunction with other public input methods.

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CHAPTER IV. PLANNING GUIDANCE FOR THE DEVELOPMENT OF MANAGEMENT PRESCRIPTIONS

Introduction

As urban areas expand and people seek the opportunity to see, touch and experience the natural world, the importance of preserving natural resources and processes has become increasingly salient. Public lands protected as parks, forests, and wildlife refuges are the primary focus for outdoor enthusiasts. Planners and managers are constantly challenged to protect resources and provide high quality recreation experiences for a growing number of outdoor recreationists. Establishment of and management for a carrying capacity, or visitor capacity, were originally seen as the primary means for reducing resource impacts, recreation crowding, and use-related conflicts.

The earliest concepts of visitor capacity were based on the premise that the relationship between use and impacts was linear, with increasing use resulting in increased impact as measured in vegetation damage, degraded water quality, and visitor crowding and conflicts (Lime, 1995). This over-simplified model of capacity led managers to conclude that a numerical capacity was required, and restriction of use was a fundamental solution to protecting resources and visitor experiences (Frissell & Stankey, 1972). However, extensive research and management experience in the last several decades revealed greater complexities in use/impact relationships. Since research failed to find a strong relationship between use levels and resource and visitor experience impacts, it has been suggested that the concept of visitor capacity should be discarded (Cole, 2001; Manning, 1999).

Although it may be appropriate to abandon the term visitor capacity, some of the driving concepts underlying it cannot be fully ignored (Cole, 2001; Manning, 1999). Recreationists demand settings with characteristics such as solitude, adventure and low levels of use-related resource impacts (Manning, 1999; Stankey & McCool, 1984). Further, agencies such as the National Park Service (NPS) are required by law to develop visitor carrying capacities in general management plans (GMPs) for all NPS units (16 U.S.C. 1a-1). The greater understanding of the relationship between use levels and resource or social impacts has shifted the visitor capacity concept and the larger arena of park planning from the idea of *how much use is too much* to *what conditions are desirable* (Stankey, 1997). There has been an increased focus on stakeholders

collaboratively defining what conditions should be maintained and what levels of impacts are acceptable in relationship to these desired conditions. If changes occur that interfere with the attainment of desired conditions, actions must be taken to minimize these unacceptable impacts and obtain desired conditions.

This approach to park planning and decision making provides a more reasonable basis for recreation management than a policy built on the illusion of scientific rationality that directly links amount of use to unacceptable impacts (Cole, 2001). Increasing dialogue with relevant stakeholders about what is important to achieve and where to achieve it helps make value judgments explicit and encourages shared learning and consensus building (Krumpe, 2000; Krumpe & McCool, 1997). In addition, defining desired social, resource and management conditions encourages investigation of multiple strategies to address recreation management's most difficult problems, rather than simply depending on use limits that are difficult to justify (Cole & McCool, 1997; Krumpe, 2000). Further, articulating specific desired conditions allows for conditions to be monitored and evaluated in terms of meeting management goals. Finally, a policy that calls for integrating multi-disciplinary sources of scientific and local knowledge to achieve agreement on desired conditions and the means to achieve those desired conditions provides a more thoughtful consideration of the larger social, political and ecological context of planning public lands.

Defining desired conditions by management zones, implementing programs to monitor these conditions, and initiating management actions to attain desired conditions are the current focus of park planning and decision making. The foundation of this approach is the collaborative definition of desired conditions. This step is defined as the development of management prescriptions, specific narrative statements that describe the desired social, resource and related management conditions of a particular management zone (NPS, 2000). In short, management prescriptions are *statements of desired conditions*. Management prescriptions focus on *what* we should manage for in terms of outcomes (e.g., In the backcountry zone, visitors will experience solitude and opportunities for self-discovery), rather than *how* we manage (e.g., In the backcountry zone, 50 visitors will be permitted to enter each day and assigned to designated travel-routes).

Prescriptions are further defined as the most specific park goals in a hierarchy that flows from general statements of policy and mission goals to management prescriptions. Management

prescriptions are resource specific (e.g., health of a riparian area) and geographically oriented (e.g., in the wilderness area of the park). Management prescriptions should provide a comprehensible picture of the character and quality of the various settings throughout a park. According to the National Park Service Sourcebook (1999) for general management planning, management prescriptions need to specify desired resource conditions and visitor experiences for particular areas based on resource concerns and a concern for diversity of visitor experiences. These statements are the foundation of guidance for sustaining high quality visitor experiences and natural resource conditions.

Through amended planning policies and the development of management decision-making frameworks such as Limits of Acceptable Change (LAC) and Visitor Experience and Resource Protection (VERP), it has been emphasized that management prescriptions are the most critical management decision in recreation planning (Haas, 2001). However, little attention has been paid to providing guidance for developing *effective* prescriptive statements. For this study, *effective* prescriptions were defined as prescriptions that are helpful for making on-the-ground management decisions in an environment of competing interests. Due to the importance of this component of the planning process, the National Park Service decided to evaluate the current development and application of management prescriptions in planning documents during a revision of NPS planning standards and accompanying sourcebook. This study focused on increasing understanding of the purpose and development process for management prescriptions based on the experiences of public land management professionals. It is anticipated that the results of this study, which evaluates current applications of NPS management prescriptions and investigates possible planning tools, will be included in the NPS' planning standards revision process as it relates to guidance on management prescriptions.

This research included a reexamination of the role of management prescriptions for park management planning and investigated tools for facilitating development of management prescriptions. To begin exploration of these concepts, in-depth interviews of six NPS land management professionals were conducted in the fall of 2001. In addition to the interviews, the study included participant observation of a planning workshop held in 2002 with 25 NPS land management professionals. The intent of the three-day planning workshop was to evaluate the current state of management prescriptions in NPS general management plans, and identify ways to improve this step of the planning process. Finally, a written survey, administered

electronically to the 25 workshop participants one month after the workshop, was used to further analyze the research concepts. This research specifically investigated the following research questions:

1. How do public land management professionals perceive the purpose of defining management prescriptions in relation to park planning and decision making?

2. How do public land management professionals define effective management prescriptions?

3. What desired condition elements related to visitor and resource management are most relevant for National Park Service general management plans?

National Park Service Planning

The National Park Service develops general management plans to improve decision making about the manner and means by which parks will be managed. Specifically, NPS plans guide managers in carrying out the agency's mission to preserve unimpaired its natural and cultural resources and related values for the enjoyment, education and inspiration of this and future generations (NPS, 2000). The NPS plans in a public environment that includes numerous demands and differing local and nationwide interests. For example, NPS planning must address questions such as what types of visitor experiences and recreation opportunities are appropriate, what role should a park play in the growth and function of neighboring towns, and what is the appropriate ecological condition of different areas in a park? The plan for a national park unit is an agreement among the NPS, its partners and the public on how and why each park will be managed as part of the national park system, what resource conditions and visitor experiences will exist and how those conditions will be maintained over time (NPS, *in development*).

Previously, the NPS did not define the types of visitor experience opportunities that should be provided or resource conditions that should be maintained. Rather, recreation management was largely driven by altering sites to accommodate increasing use levels (NPS, 1997). The NPS addressed visitor use levels in management plans in relation to facility capacities, based on the sizes of existing parking areas, visitor centers, campgrounds and other developments (Hof & Lime, 1997). The relationship of the incremental and successive changes in use types and levels to the nature of recreation settings was not generally recognized.

Over time, it has become widely acknowledged that these kinds of management changes can have significant effects on the character of these places, and therefore possibly the nature of visitor experiences that are being achieved (NPS, 1999). The result of this acknowledgement has been a shift in planning guidelines from an issue driven process to a goal-oriented process (Hof & Lime, 1997). The focus of planning is no longer on resolving problems or issues but rather on clearly defining what conditions are desirable. One of the fundamental components of the revised planning approach by the NPS is the development of management prescriptions in general management plans. This step in the process integrates the analysis of park resources and visitor experiences to establish desired conditions for the park. Management prescriptions also help identify those indicators and potential standards that may be monitored during the life of the general management plan. Management prescriptions are usually defined either by geographic zone or for the entire park regarding a specific resource type (e.g., air quality). Most parks have both kinds of prescriptions and usually multiple management zones (NPS, 1999).

The NPS' most recent *Management Policies 2001* and related guidance documents state that management prescriptions are the foundation for park management and decision making. These policies and directives confirm that management prescriptions are intended to ensure that the "park's overall diversity of experiences, environmental quality, and cultural integrity are not inadvertently eroded by a series of actions to address specific problems." The current revision of the NPS planning standards and related sourcebook is intended to provide additional emphasis and guidance on the need for well-crafted management prescriptions.

Emphasis on Management Prescriptions

Changes in recreation opportunities and resource conditions will occur, regardless of whether they have been anticipated or sanctioned by managers (Hendee, Stankey & Lucas, 1990). Without explicit definition of desired visitor experiences, changes in the nature of the recreation experience will occur slowly and unnoticeably as visitor activities and interests change over time. Similarly, in the absence of guidance, incremental or rapid changes will occur in resource conditions – some that may later be viewed as unacceptable or that are long-term and even irreversible. Further, almost any site can be developed and hardened to accommodate a proposed recreation activity and make the site more resistant to change (Lime, 1995). But, even small changes in the design and type of facilities can alter the character of the site until it is no

longer satisfactory to current users (Lime, 1995). Therefore, management strategies must be based on how a change in resources is related to a site's management prescriptions, emphasizing the need for management prescriptions to "define, as specifically as possible, the kind of recreation opportunity or opportunities the area is to provide" (Lime, 1995, p.22).

Management prescriptions are influenced by many factors, including agency policies, managers' personal values, physical resources of the area, and the attitudes and expectations of visitors. Obtaining and synthesizing this information is a complex process. Through increased understanding of the role and importance of management prescriptions in the planning process, there can be additional focus on providing tools that may facilitate and improve the development of management prescriptions. This research investigates the potential improvement of park planning efforts by exploring the purpose and construction of management prescriptions. This study began with investigation of the purpose of management prescriptions and their perceived effectiveness, as defined by NPS public land management professionals with experience in recent park planning efforts. In addition, this study investigates the criteria that are important for effective prescriptive statements. By gaining the perspective of experienced public land management professionals on the characteristics that define useful prescriptions, a shared network of information can be developed. Finally, this study identifies the condition elements related to visitor and resource management that are most relevant for management prescriptions in NPS general management plans based on the previous experiences of public land management professionals. The intent of the menu was not to develop standardized prescriptions but rather to provide some suggestions on condition topics that would help guide the prescription development process.

Study Methods

Much can be gained from analyzing what land management professionals have learned about the purpose and construction of management prescriptions from their experiences in park planning. Some relevant commentary has been provided on this topic from the academic community, but very little research has examined the process from a planner's or manager's perspective. The emphasis on learning from experiences prompted the use of qualitative methods. Qualitative research is often used to "discover and understand a phenomenon, a process or the perspective and worldviews of the people involved" (Merriam, 1998, p.11).

Further, the study was intended to examine how one part of the planning process, the development of management prescriptions, fits within the whole process of park planning and decision making. Unlike quantitative research, which deconstructs a process to understand its parts, qualitative research aims to examine the parts in relation to the whole (Merriam, 1998). The methods for this study included in-depth interviews, participant observation, and a written survey.

Participant Selection

The study began with personal interviews of six public land management professionals. These individuals were park planners, park mangers, and resource management specialists. Participants were chosen from parks that have recently, in the last 10 years, been through a general management planning process. The participants were selected through purposive sampling based on their knowledge of the research topic. In addition to the interviews, participant observation was conducted during a planning workshop with 25 participants. The participants were public land management professionals from the NPS, including park planners, park managers, and resource and visitor management specialists. Participants were chosen due to their recent involvement in general management planning. The written survey was conducted with the same 25 workshop participants.

Data Collection

Data collection for the study included interviews, participant observation and a survey, along with review of journal articles and government documents. Interviews were of a semi-structured nature and lasted thirty to sixty minutes each. An interview guide (see Appendix C) was developed, composed of open-ended questions that were intended to lead respondents to discuss themes that were relevant to the research questions without directing them to discuss specific topics. Some of the interviews were conducted in person. Other interviews were conducted via telephone due to location constraints. The interviews were taped and a verbatim transcript was developed immediately after the interview. Participants signed an informed consent form prior to tape recording the interviews.

The participant observation was conducted during a three-day planning workshop with NPS staff in Denver, Colorado. The planning workshop was held to discuss topics directly

related to the research questions of this study. Some of the main topics of the workshop were to revisit the purpose of management prescriptions, identify issues/concerns with existing prescriptive statements or the development process, define important ingredients for prescriptive statements and consider how prescriptions fit within the NPS' overall planning framework. The workshop included multiple planning exercises as well as informal discussions. The intent of the participant observation was to observe and record the ideas and thoughts of participants related to the meeting objectives. Participant observation allows a firsthand encounter with the phenomenon of interest (Merriam, 1998). In this instance, the relationship between the observed and the observer can be classified as participant as observer, where my research activities, which were known to the group, were subordinate to my role as participant (Merriam, 1998). Through first hand observation of the planning exercises and informal discussions, a great deal of insight was possible on the considerations made in response to the major topics of the workshop. Detailed notes were taken during the exercises and discussions. Results of the planning exercises were also transcribed verbatim from the meeting flipcharts. The information from each of the exercises and discussions was then organized based on emerging themes.

Following the workshop, a synthesis of the interview and participant observation data, along with supporting literature, was presented to the planning workshop participants through a written survey (see Appendix D and E). The survey was administered electronically about one month after the planning workshop. Journal articles and government reports were selected and coded to support emerging themes resulting from the interview and participant observation process. The survey participants were asked to critique the organized themes on the purpose of management prescriptions, the criteria for effective prescriptions, and topics related to visitor and resource management conditions. Key sources for identifying the natural resource condition topics in the menu of desired conditions included work by the Environmental Protection Agency (1999) and The Nature Conservancy (2000). The following questions (Table 10), relating to evaluation of the purpose statements, demonstrate the type of questions asked in each section of the survey.

Table 10: Example of Management Prescription Survey Questions Administered to NPS Staff

1. Does the list above fully capture the purpose of management prescriptions? If not, please provide any additions that need to be made and provide an explanation.
   (Please insert your response here.)

2. Could anything in this list be omitted? If so, please list the topic to be omitted and provide an explanation.
   (Please insert your response here.)

3. Do the purpose statements need clarification or revision? If so, what changes would you make?
   (Please insert your response here.)

4. Do the labels supplied adequately reflect the intent of the statement? If not, what changes would you make?
   (Please insert your response here.)

Survey participants were also asked to reflect on whether they felt the synthesized material adequately captured the intent of the workshop discussions.

The survey participants were given approximately one month to respond with comments on the summarized materials. Five participants responded within the designated comment period. A follow up letter from the NPS Chief of Park Planning yielded three additional responses. Follow-up phone calls yielded only one more response. Nonrespondents attributed their inability to participate to busy summer schedules.

Data Analysis

Analysis of the interview, participant observation and survey data was conducted using the constant comparative method. This method includes review of dominant themes, allowing the discussion to be meaningfully organized, interpreted, and presented (Merriam, 1998). Although an attempt was made to select professionals for the interviews and planning workshop with a wide range of characteristics, sampling was not random. Since the goal of this research was to investigate professionals' perspectives and experience with park planning and decision making, the ability to provide relevant and thoughtful detail was of most concern. The use of

multiple quotes and discussion of the research context allows readers to determine whether the findings are transferable.

Results

      The discussion that follows begins with an overview of the results of the in-depth interviews in regards to the three main research questions. Following the interview results is a brief synopsis of the data collected during the participant observation of the planning workshop. An extensive amount of information was collected during the participant observation that assisted development of the study's final products. Due to the quantity of data, only a short summary is included to provide evidence of the major ideas expressed by the workshop participants. Finally, the results of the written survey are highlighted. The survey respondents provided extremely detailed and extensive comments on the summarized material, so only excerpts of the comments are included in the following discussion to provide a sense of the type and extent of the respondents' input. The information gained through all three methods was analyzed and combined into a final draft of the purpose statements, the list of criteria, and the list of relevant condition topics.

Purpose of Management Prescriptions

      The study's first research question addressed the perceived purpose of management prescriptions by public land management professionals. Management prescriptions have become widely accepted as a component to public land management plans. However, it is unclear how significant these statements are in actually facilitating day-to-day park management and decision making. Cole and Stankey (1997) suggest that the lack of specific and attainable descriptions of desired conditions makes it impossible to distinguish problem situations, identify management strategies or evaluate management success. The first research question of this study addresses the perceived purpose of these prescriptive statements by public land management professionals who must make recreation management decisions on a day-to-day basis.

      In the interviews, land management professionals noted that defining desired conditions allows them to be proactive rather than reactive about what opportunities should be provided, the essential elements of those opportunities and where they should be provided. Most importantly, formulation of management prescriptions forces park staffs and the public to converse about the

values associated with those opportunities. When asked during the interviews what was the most important element of park planning, a chief of resource management responded, "the park has to sit down and clearly define what it is they value – what is the value to the public, the resources, recreational values, the spiritual values, the cultural values – all those things. Now we get into what we call desired conditions." Another resource management specialist highlighted the critical role that defining desired conditions plays in addressing trade-offs between visitor impact management strategies and the visitor experience:

> We could go to an area, where we are seeing the beginnings of trail widening and social trailing to private spots from the main trail – we could go there and say, well, we can harden this resource – we can bring in plenty of more people. But on the other hand, this area's charm and quality to me and to many other folks is because it is not highly engineered – the trails aren't as well maintained – they are a little bit harder to find and follow – it is a little bit more wild and probably better in my mind for us to say [that] those are the qualities of this experience that we want to retain because we can't get that anywhere else in this area or in this region.

Defining desired conditions also provides a consensus building opportunity for identifying shared values to guide current and future management. A chief ranger noted these points during the interviews:

> If you understand what is ideal … that should greatly help you in at least having a goal, that hopefully the manager would have had a role in defining. Not just the manager, but the park staff and outside resources, the publics or professionals – you put all that together and you are able to come up with a goal or endpoint – you may never reach it, but it is something that you can verbalize and [can be] sold to new staff coming in – that is what helps you in putting together management actions to try to reach that endpoint.

Further, a senior planner noted during the interviews that prescriptive statements are integral for strategizing management and ensuring accountability of the park's administration:

> Not only is the Park Service going to use that information, but also others who are interested in our management of an area. They are going to be comparing management with those words - seeing, gauging how we are doing.

Every interview respondent indicated that management prescriptions are the most important component of the planning process and that more effort should be placed on developing effective prescriptions for parks.

It also seemed that there was general consensus that defining desired conditions in qualitative terms meets NPS' 1978 legal requirement to address carrying capacity. As noted by a planner during the interviews:

Well, I think we have come a long way from the 1978 Act and who knows really what Congress was trying to say by carrying capacity. But I think the term, at first, seems to imply that there is a number that would cap the number of visitors you would allow in a park, whereas that is certainly not the approach that this park is taking in terms of carrying capacity. It goes back to determining desired conditions and measuring that by whether certain conditions are met or not. There is no way of telling what number that may be.

An assistant superintendent concurred that there was a new philosophy for addressing the legal requirement of carrying capacity, "I think the current thinking is not to worry too much about the number, but to worry about the conditions that you want to try to preserve, whether it is conditions of the resource or conditions of the experience."

In summary, interview respondents consider management prescriptions the foundation of NPS general management plans. Defining desired conditions allows park managers to be proactive about the type of resource conditions and associated visitor experiences that are appropriate to maintain the integrity of natural and cultural resources and a diversity of visitor experiences. By defining desired conditions, the park and the public are forced to get out of an operational mode and into the process of articulating values and setting goals. It was suggested that this process focuses management priorities and provides a defensible link between current and future management actions.

During the planning workshop, the workshop participants were also asked to consider the purpose of management prescriptions based on their experiences with developing general management plans. Table 11 includes excerpts of participants' responses organized by major theme.

Table 11: Planning Workshop Participants' Responses to the Purpose of Management Prescriptions

Provide a vision for park resources
- Focus attention on the big picture/move from day-to-day thinking to visioning
- Establish qualitative indicators for monitoring change

Provide an opportunity to increase public understanding and gain wider support
- Build public awareness and support for goals
- Help visitors make choices – provide choices for visitors

Establish a foundation for making decisions among alternatives and daily management strategies
- Provide political/legal support for making hard decisions
- Provide consistency, accountability, in park decision making

Set management direction and priorities for park resources
- Tool to help allocate resources (process and product are both important)
- Help park make operational priority decisions

Connect park's mission, laws, and mandates to on the ground management
- Provide link between law/purpose/significance and actions on the ground
- Provide basis for NEPA impact analysis and NHPA 106/address transitions among zones – example noise effects on experience

Unify management of park resources, including those outside park boundaries
- Provide link between parks and adjacent areas
- Resolve conflicts between natural resources and cultural resources – provide clarity for management and visitor experiences

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The information collected on the purpose of management prescriptions during the interviews and participant observation of the planning workshop was combined by major theme and presented in a written survey to the workshop participants. Each theme was summarized into a one-word descriptor or label (e.g., linkages) by the author, followed by a definition of the concept (e.g., establish relationships between natural and cultural resources). Participants in the written survey were asked to revise the descriptors and statements in terms of additions, deletions and clarifications that were needed. The respondents provided extensive and detailed comments that were used to revise the list of purpose statements for management prescriptions. Due to the level of detail, only a few statements from the survey respondents are provided here to

offer a sense of the type and extent of comments that were made. The following comments were from a cultural resource specialist and natural resource specialist respectively:

> I think the "Support" statement does not adequately reflect the fact that formulation of prescriptions is an opportunity for us to learn from publics/constituents/stakeholders. Planning is not just a matter of our getting buy-in from others for things we have already decided we want/need to do. Planning involves consultation—a meaningful exchange about information, values, and strategies in which, if done well, the NPS planners/staff/managers learn at least as much as they impart to others.

> Change "Vision" to "Direction." Management prescriptions should also provide Direction. "Vision" is not the same -- we've had a lot of "visioning" efforts, and they don't seem to make a lot of concrete difference. "Direction" implies goals toward which we will direct our activities.

Based on final revisions made from the survey responses, the purposes of management prescriptions are summarized in Table 12. Since management prescriptions are considered the heart of general management plans, it is critical that the importance and purpose of these statements are clearly articulated in planning guidelines. Planning staffs can use the formal definition of the purpose of management prescriptions as an education tool when initiating this step in the planning process. This tool would clarify the rationale that will guide the development of prescriptions, as well as the level of importance placed on this component of the planning process.

Table 12: Summary of Purposes of Management Prescriptions

Direction	
	Provide long-term direction for desired conditions of park resources and visitor experiences—what park stakeholders want to achieve and where they want to achieve it—while providing managers the flexibility to respond to rapid and constant change.
Linkages	
	Establish relationships between natural and cultural resources and visitor experiences, and parks and regional contexts.
Understanding	
	Increase understanding and gain support for management goals and actions from park staff, relevant stakeholders, and the general public.
Accountability	
	Establish a logical, trackable decision trail by connecting on-the-ground management to the purpose of the park, legal and policy requirements, and analysis of issues and impacts in a public forum.

Criteria for Management Prescriptions

The second research question investigates how land management professionals define effective management prescriptions. Scientists have suggested that *specific* management prescriptions are desirable, but the definition of specific and its implications for decision making are not clear. Haas (2001, p.19) recently noted, "There is a need to move beyond planning and managing for general activities and to move beyond ambiguous experiential phrases." The academic community has suggested that the more measurable the statement, the greater the ability of managers to assess progress and determine the appropriateness of the condition (Lime, 1995).

When questioned about criteria for effective prescriptions, interview participants also responded to a need for specificity in management prescriptions. For example, one planner commented on an experience with developing prescriptions that were considered by the public to be inadequate in terms of the level of detail:

> They wanted to know what's going to happen with the area that I go to or the trail that I use, the road I drive, that kind of thing, that kind of detail was not in the plan, so we are putting it in there…We are narrowing down the zones and trying to flesh out the management prescriptions so that people have a better understanding of what's going to go on in a given area.

The interview participants also indicated that there is a great deal of concern, as well as confusion, over the concept of specificity for management prescriptions by public land management professionals. The line between specificity for clear guidance and generalness to preserve management flexibility is potentially confounding. During the interviews, an assistant superintendent discussed the concerns about management prescriptions that are too vague, "the more general you make it, the more room you leave for interpretation [by future decision makers]." On the other hand, prescriptions with excessive detail can limit management flexibility that may be needed to react to changes in knowledge or relevant social, resource, or political conditions. A park superintendent noted concern over having management prescriptions be too specific:

> As a manager, I prefer flexibility when looking toward having eventually to deal with unknown future challenges, not narrow sideboards or very specific constraints that may not be applicable or adaptable in later years. Also, the greater the level of detail and specificity considered for management prescriptions, the more complex, lengthy, potentially controversial, and protracted the public involvement is likely to be.

A chief of resource management commented on the difficulty planning teams face when dealing with finding the appropriate level of detail for management prescriptions:

> Our experience is that prescriptions can be fairly difficult to articulate sometimes – easy to write in general terms, but to make them specific either qualitatively or quantitatively, it is more difficult. Across the staff and the management who are responsible for different parts of the park – they look at it differently – it is hard to get those folks to agree and marry those opinions into a concise statement.

Based on the results of the interviews, it seems that one of the most difficult aspects of defining prescriptions is articulating desired conditions with sufficient specificity to be meaningful, while preserving management flexibility over the life of a general management plan. This was the focus of discussions with interview respondents and seemed to be the topic that most respondents felt needed more attention from the perspective of agency planning guidance. It was noted that lack of data was one of the major hurdles for being more specific when defining desired conditions.

During the planning workshop, the workshop participants were also asked to consider the criteria of effective management prescriptions based on their experiences with developing general management plans. Table 13 includes excerpts of the workshop participants' responses organized by major theme.

Table 13: Planning Workshop Participants' Responses to Important Criteria of Management Prescriptions

Need to understand the relationship between adjacent zones and define management prescriptions in a more holistic context
− Identify the ecological ramifications of zones with different management prescriptions
− Should consider the ecological effects of juxtaposing certain zones.

Management prescriptions need to consider regional context
− Prescriptions/zoning need to consider local/regional political context.
− Management prescriptions need to consider the greater ecosystem – e.g., resources and connections beyond the park.

Management prescriptions need to be resource-based
− Need to focus on target resource conditions – related to human activities (visitor and staff and outside influences)
− Must integrate natural and cultural resources and visitor experiences. Visitor experience conditions will be designed to support resource goals.

Management prescriptions need to have an appropriate level of detail
− Defining a level of detail for desired conditions that sets a clear direction but allows flexibility to respond to change.
− Conceptual to apply to many situations but sufficiently specific to be meaningful (unambiguous language for staff, public and others).
  Example:
    • Less clear – restore the Vick battlefield to the time of the battle;
    • More clear – restore the post battlefield/forest pattern while retaining the commemorative landscape.

Management prescriptions need to be prescriptive and focus on long term outcomes
− The development of management prescriptions should include re-examination of resource conditions and "best practices" for preservation and conservation.
− Management prescriptions should address a longer-term vision, a more generational perspective

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The information collected on the criteria of management prescriptions during the interviews and participant observation of the planning workshop were also combined by major theme and presented as part of the written survey to the workshop participants. Similar to the purpose statements, each theme related to criteria was summarized into a one-word descriptor or label by the author, followed by a definition of the criterion. Participants in the written survey were asked to revise the descriptors and statements in terms of additions, deletions and

clarifications that were needed. As previously noted, the survey respondents provided extensive and detailed comments that were used to revise the list of criteria for management prescriptions. Due to the level of detail, only a few statements from the survey respondents are provided to offer a sense of the type and extent of comments that were made. The following comments were from a community planner, a regional planning director, and a natural resource planner respectively:

> The "specific" and "flexible" criteria seem to be in conflict. How can you be both specific and general? Perhaps the idea of this management prescription being applicable for the long term could be moved to the "future-oriented" criterion and the "flexible" criterion deleted.

> In the first prescription statement (Specific), change to read, "Clearly worded and detailed enough to indicate implications of decisions..."

> Essential attribute of visitor experience is visitor enjoyment and understanding. NPS goal is not just a variety of experiences, but the meaning in them. Recommend changing "visitor experience" to "visitor enjoyment and understanding" throughout.

As a result of the various methods of the study, numerous criteria were defined as important for guiding effective management prescriptions. Based on revisions made as a result of the survey data, the criteria for management prescriptions are summarized as follows (Table 14).

Table 14: Summary of Criteria for Management Prescriptions.

Results oriented

Address conditions rather than specific management actions--the "what," not the "how."

Resource based

Focus on the conditions of resources and the related opportunities for resource-based enjoyment of parks.

Focused

Focus on the *fundamental* resources and values of the park – the resource systems, features, processes, and opportunities for visitor enjoyment that are fundamental to achieving a park's purpose.

Holistic

Identify the relationships among resources and experiences within zones, among all the park zones, and within and outside park boundaries--reflect the larger social, political, and ecological context of park resources and values and make the appropriate linkages.

Future oriented

At a minimum, consider the 15- to 20-year time frame for the general management plan. Some resources may require a longer perspective.

Defensible

Stem from and are grounded in the park's purpose and significance. Reflect the best available information, including outreach to sources of expertise, and the latest knowledge on best management practices.

Responsive

Reflect the range of reasonable approaches to park management and use supported by the park's various stakeholders.

Useful

Are clearly worded and detailed enough that park staff and the public have a shared understanding of the implications of implementing the prescription.

One of the most notable results of evaluating the concept of effective prescriptions included acknowledgement that general management plans should provide more clarity on desired conditions for resources and visitor experiences, but with a focus on those resources that are fundamental to achieving the park's purpose. During the planning workshop, participants had a lengthy discussion over the following participant comment: "Include description of the desired future condition for critical/significant resources as defined by park significance statements, mandates and laws, and inventory analyses." A near consensus was reached that the plans should restrict the breadth of coverage to permit a more comprehensive focus on what can be defined as the park's "fundamental resources and values." These resources and values should be identified at the outset of the planning process to guide data analysis and issue identification. Further, management prescriptions should focus, in more detail than found in existing plans, on the desired condition of these fundamental resources and values. Those participants who

disagreed with this concept stated that restricting plans to discussion of fundamental resources and values contradicts the philosophy of ecosystem management, where all resources and processes are connected. These participants suggested that the lack of information on ecological connections makes defining fundamental resources and values almost impossible.

Regarding the confounding issue of the appropriate level of specificity for management prescriptions, this research did not reveal a formula for the ideal level of planning detail. Rather, the level of detail may vary from one plan to another and from one desired condition topic to another based on the planning context. However, a consensus emerged on the critical questions that should be asked when evaluating whether management prescriptions meet the "useful" criterion (Table 14). The first question is whether the parties involved in the planning process have a shared understanding of the implications of implementing the prescription. Further, it was recommended that independent reviewers be consulted on their interpretation of the management prescriptions to identify gaps in understanding or meaning. The second question, to aid identification of the appropriate level of specificity, is to ask whether all parties involved can accept the management prescription for the next 10-15 years. In short, does the prescription allow for changing knowledge and resources? It is expected that the consideration of these evaluative questions and the criteria for management prescriptions can assist planning teams in developing more effective prescriptions. The criteria can serve as a checklist against which prescriptive statements can be evaluated.

Guidance for Defining Desired Condition Topics

The need for guidance on identifying appropriate topics for management prescriptions related to desired resource conditions and visitor experiences was also investigated. A great deal of effort from the academic community has been invested in identifying appropriate indicators and standards for the monitoring component of the VERP process and related management plans, but with little or no connection to the establishment of management prescriptions. Several interview respondents noted that planning teams have struggled with initiating the development of management prescriptions due to inexperience with the process, lack of important information, and overload on operational concerns. One of the most difficult tasks in developing prescriptions is the need to articulate values rather than operational issues. A chief of resource management commented on this issue during the interviews, "How do we get people into that

mode – out of the operational mode into thinking about values? We have a lot of other hot issues to deal with besides planning. We are all committed people. It is always a trick to get people to think about values."

Further, it was expressed that existing prescriptions are not adequate with regards to the comprehensive treatment of park resources and visitor experiences. For instance, it was often mentioned that prescriptions are exclusively focused on visitor uses and development with little discussion of larger resource issues or interpretive themes. An assistant superintendent stated, "If you look at a lot of general management plans out there...they are not about the resources, they are about providing for the visitors." Also, it was noted that there was a lack of consistency between plans in terms of the important elements that should be included in management prescriptions. One planner noted during the interviews:

> I think the format or framework needs to be pretty standard, so between general management plans for instance you could go, and in any plan for that matter, you should be able to go and find certain things. For instance, what is the desired condition and why have you defined it as such. What is the desired visitor experience here…and what desired resource conditions are we shooting for here. I think every plan should have some commonality in that respect.

In summary, the interview respondents suggested that existing prescriptions in general management plans are not adequate in their comprehensive treatment of park resources and visitor experiences. Most often, general management plans are perceived as "visitor services" plans, since prescriptions are exclusively focused on visitor uses and development. Also, it was noted that there was a lack of consistency between plans in terms of the important elements that should be included in general management plans. Finally, it was acknowledged that many planning teams struggle with identifying the appropriate resources and values that should be the focus of general management plans.

During the planning workshop, the workshop participants were also asked to consider the relevant desired condition topics for general management plans based on their experiences with developing and implementing general management plans. Table 15 includes excerpts of the workshop participants' responses organized by major theme.

Table 15: Planning Workshop Participants' Responses to Important Desired Condition Topics

Natural resource topics
- Increased emphasis on ecosystem processes (e.g., Wildlife species native to the park are conserved. Habitat connectivity is maintained to allow genetic interchange and reestablishment of populations in the event of local extirpation). EPA's ten aspects of ecosystems commonly affected by human activities may be helpful.
- Define resource conditions beyond those affected by visitor activities and facilities.

Cultural resource topics
- Condition of major cultural resource topics should be defined – cultural landscapes, ethnographic resources, archeological resources, historic structures, museum collections, etc.
- Management prescriptions should specifically state the treatment selected from the secretary's standards (Preserve, rehab, restore, reconstruct). Needs to include couple of sentences that define the treatment for this specific prescription (restore structure to time period – give ramifications).

Social setting topics
- Desired visitor experience descriptions should include sensory experiences, interpretive themes, expectations (e.g., required skills, experience, risk level), level of orientation
- Description of appropriate infrastructure/management intervention to support visitor experience (on and off-site)

The information collected on the relevant desired condition topics during the interviews and participant observation of the planning workshop were combined by major theme into a menu of desired condition topics and presented in the written survey to the workshop participants. Survey participants were asked to revise the menu of topics in terms of additions, deletions and clarifications. Survey respondents provided extensive and detailed comments that were used to revise the menu of condition topics. Due to the level of detail, only a few statements from the survey respondents are provided to offer a sense of the type and extent of comments that were made. The following comments were from a director of interpretive planning, a regional planning director, and a natural resource specialist, respectively:

> We have increasing evidence (e.g., Harper's Ferry Center-sponsored study of visitor experience at Rocky Mt. and Yellowstone in 2001; compilation of Visitor Studies Project surveys) describing visitors' preferences for information that relates directly to their experiences, with experience being the primary goal. Knowledge gain should be seen as important, but secondary. In a voluntary, recreational endeavor it is supremely important to understand what visitors want and expect. If we want them to learn things ("What are the main messages, and what knowledge gain is expected of the visitor?") we need to

identify and make accessible the experiences (especially resource-based experiences) that support the information.

Consider switching the order of the subsections, placing Resource Condition ahead of Social Condition. The new order would align more closely with our mandate to preserve resources (protect against impairment) over all else.

Following are some additional examples that could be included in each of the natural resource categories:
Natural disturbance regimes: Outbreaks of pests or disease, landslides.
Structural complexity: Woody debris, cave formations, cryptogams, coral reefs, kelp forests, multi-layered forest canopy.

Based on revisions made as a result of the survey responses, the menu of desired condition topics has been summarized in Table 16. Due to the complexity of defining desired natural resource conditions, the menu for the natural resource topics is divided into major resource considerations followed by resource subtopics that may need to be defined if critical to supporting the fundamental resource conditions. In some cases, prescribing management for the subtopics may be vital for understanding the overall desired condition of the fundamental resource. For example, if the fundamental resource is salmon, the most meaningful prescriptions would focus on desired conditions for characteristics of the salmon-spawning habitat such as hydrologic conditions (e.g., water depth and clarity, surface and sub-surface flow conditions) and other channel conditions (e.g., sediment supply). Further, due to the length of the descriptions for the different desired condition topics, only the desired condition topics are included in Table 16. In Table 17, an example of the level of detail for the desired condition descriptions is provided for illustration. The full menu of topics and related descriptions are being included in the updated sourcebook for NPS planning standards.

Table 16: Menu of Desired Condition Topics

Natural Resource Conditions

Ecological landscapes (e.g., spatially related area linked by ecological processes, environmental features (e.g., topography, soils, geology) or environmental gradients (e.g., topography))

      Biological processes (e.g., nutrient cycling regimes, purification regimes)

      Biotic interactions (e.g., predatory/prey relationships, specialist vs. generalist species, native vs. exotic species, pollinator/pollinated species relationships).

      Natural disturbance regimes (e.g., fire, flood, earthquake, landslides, storm erosion).

Specific species (e.g., threatened/endangered, endemic, rare, or migratory species or other species with vulnerable life histories).

      Habitat attributes (e.g., structural complexity, diversity, connectivity)

Hydrologic features (e.g., desert springs, major surface or ground water bodies)

      Hydrological interactions (e.g., surface/subsurface water interactions)

      Hydrological processes (e.g., water flow dynamics, structural complexity, nutrient and temperature regimes)

Geologic features (e.g., karst/cave formations, geothermal/hydrothermal resources, dunes, arches, soil types).

      Geologic processes (e.g., shoreline and barrier island formation, soil/rock erosion)

Soundscapes and Lightscapes (e.g., night skies)

      Air quality related values (e.g., visibility, resource protection)

Cultural Resource Conditions

Archaeological resources

Cultural landscapes (e.g., spatially related area linked by resources representing historical continuums)

Ethnographic resources

Historic and prehistoric structures and ruins

Museum collections

Social Setting Conditions

Opportunities to see/experience outstanding natural and cultural features/processes

Opportunities to understand the history and culture of the region, nation, and/or world and opportunities to understand natural systems and processes

Opportunities to experience meaningful visitor perceptions such as wonder, discovery, adventure, social affiliation, isolation, and freedom, related to the park's natural and cultural resources

Opportunities to share cultural heritage with others

Opportunities for recreation activities that are uniquely suited and dependent on the fundamental resources in the park

Other uses/activities other than public enjoyment that are uniquely suited to or dependent on the fundamental resources in the park.

Related Management Conditions
Visitor use types and levels

Level of effort, risk, time and skill required by visitors to experience the area

Level of education, interpretation and orientation provided to visitors

Evidence of management and visitor use activities

Focus of management activities for the zone (e.g., custodial management versus allowing natural processes versus restoration of natural processes), including the degree and extent of management actions

Level of importance of the area for baseline resource inventories, social science research and long-term ecological observations

Types and character of infrastructure and amenities, including prominence of the development footprint

Level of access and how it may differ for existing versus new structures

Primary modes of circulation for visitors and staff, including the primary means of conveyance - motorized versus non-motorized in different areas and for what purposes (e.g., recreation versus transportation).

Types of roads and trails that will be provided in terms such as paved, improved, or primitive – note if an area may be predominately trail-less and/or road-less.

Table 17: Examples of Desired Condition Topic Descriptions

Natural Resource Conditions
Ecological landscapes

    For those ecological systems that disproportionately contribute to ecosystem functioning within the landscape or region, define the desired health and size of these areas. Include discussion of any elements of the ecological system that are particularly critical to achieving the desired landscape conditions such as nutrient cycling, purification services, structural complexity, etc. Define the desired relationship between human activities and the condition of these landscapes and related elements. Also identify and describe the desired condition of any rare landscapes, including tolerance for potential influences from human activities.

Cultural Resource Conditions
Historic and prehistoric structures and ruins

    Define the desired treatment (e.g., preservation, rehabilitation or restoration) of extant structures and the relevant target for the treatment (e.g., rehabilitate to condition representative of the time period of the battle). Describe the level of alteration that would be permitted for non-contributing additions and/or adaptive reuse.

Social Setting Conditions
Opportunities to experience meaningful visitor perceptions such as wonder, discovery, adventure, social affiliation, isolation, and freedom, related to the park's natural and cultural resources.

Define the desired sensory experience for visitors including what they may feel, see, and hear in relation to natural and cultural resources when they enter and move through the zone. Define the level of intimacy with resources (e.g., how close/involved visitors are to touching, seeing, and feeling natural surroundings and points of interest). Describe the desired character of the sensory experience in terms such as wonder, adventure, discovery, isolation, remoteness, social affiliation, competitiveness, etc. Be sure to characterize the expectation of visitors in interacting with other users (including diverse types) and park staff (rangers, guided tours, commercial guides). Identify any differences in the magnitude of interaction at attraction sites versus along travel corridors. Identify any differences in the character of the experience to diverse groups based on ethnicity, age, experience, socioeconomic level, etc.

Related Management Conditions
Level of education, interpretation and orientation provided

Describe the desired linkages between interpretive themes, resources, and experiences (e.g., provide opportunities for interpreted views of cliff faces with strata, river beds, unconformities, talus slopes, etc.). Identify the desired intent of educational and interpretational materials/programs in achieving these linkages (e.g., help visitors engage in critical thinking about historical/cultural or natural themes or issues). Define the desired levels/intensities of orientation information to be provided. Also, note the desired level of information that may be provided onsite versus offsite.

The menu is intended to be another tool to assist the development of effective management prescriptions. The menu was developed to provide one avenue of idea generation for this step in the planning process. The menu of conditions and related descriptions should be used as discussion points only, rather than as strict guidelines for what conditions are defined. Only through additional case studies can the usefulness of this planning tool for general management planning be evaluated. Further, it is not suggested that this menu will be directly applicable to the planning efforts of other public land managing agencies. Rather, it is suggested that other agencies may benefit from the identification of important topics relevant to the mission and purpose, as well as planning structure, of those agencies.

Discussion

For park planning to be successful it must assist in control or mitigation of unacceptable impacts to resources from various land uses and provide high quality visitor experiences, while gaining support of the constituency. For planning to be efficient it must support the discovery of

the most beneficial management practices, while minimizing costs. For it to be valuable, the plan must contribute to attainment of larger goals asserted by an agency's mission, such as achieving a sustainable balance between recreational use and resource functions. Experiences in the field have indicated that by emphasizing the collaborative definition of desired conditions, the field of recreation management has made great progress towards meeting these goals.

Although there has been a general acceptance by the planning community that we must focus on long-term desired conditions, an examination of planning efforts suggests we must expend greater effort to articulating these conditions. One of the foremost concerns of early wilderness plans was the absence of specific, achievable management objectives for wilderness conditions (Cole & Stankey, 1997). The descriptions for desired conditions were too general, such as "maintain natural processes" and "provide solitude." Haas, Driver, Brown and Lucas (1987) also suggested that most of the earlier wilderness management plans in the 1960s and 1970s contained "one generic management direction" for an entire area, and that this lack of specificity led to ineffective plans. Washburne (1982) suggested that failure to define desired conditions detracts from the primary mission of public land managing agencies, which is to decide what conditions are appropriate.

Although this problem was identified over a decade ago, it still persists. Based on an extensive literature review and discussions with NPS professionals, it seems the recreation management field has not adequately focused on the nuances of how to articulate desired conditions. As noted in the interviews, management prescriptions in NPS plans are too vague and often focused too heavily on the visitor use aspects of park management.

Other agencies have recognized similar deficiencies in their planning efforts and have released new directives that call for an improved clarification of desired conditions for key elements of public land management. The United States Forest Service recently presented, for public comment, a revised National Forest System Land and Resource Management Planning Rule. In the revised rule, there are recommendations to provide more specific statements of desired conditions for particular resources such as vegetation, recreation, cultural and heritage resources, and watersheds, developed within the context of ecological, economic, and social systems (36 CFR Part 219). Parks Canada has also recently revised directives for management planning of Canadian National Parks, which include an emphasis on clearly prescribing management for "key park features and values." The new directives suggest that management

goals or prescriptions should not be broad general statements that can apply to any national park, but rather should be park specific and a direct link to key ecological and social elements (Parks Canada, 2000).

To address concerns over this step in National Park Service planning, this research included a reexamination of the role of management prescriptions for park management planning and investigated tools for facilitating development of management prescriptions. Regarding the perceived purpose of management prescriptions, there was general consensus among the professionals participating in the various steps in the study that management prescriptions are the foundation of NPS general management plans. All of the respondents suggested or agreed that defining desired conditions provides long term direction and allows park managers to be proactive about the type of resource conditions and associated visitor experiences that are appropriate to maintain the integrity of natural and cultural resources and a diversity of visitor experiences. There were no conflicting purposes that were defined by any of the study participants. Most participants agreed that focusing planning efforts on defining desired conditions was preferable to NPS' previous approach of creating plans that dealt with specific issues or problems by altering the level of development.

With regards to developing effective prescriptions, most professionals seek specificity in statements of desired conditions. However, the study participants were not in agreement on the appropriate degree of specificity, or exactly how to define it. From a research methods perspective, it was difficult to find ways to have participants evaluate appropriate levels of specificity. During the planning workshop, participants were given examples of management prescriptions from existing NPS plans. Participants were asked to evaluate the prescriptions in terms of whether the prescriptions were effective for long-term guidance. Although this exercise produced some useful information in terms of characteristics of effective prescriptions, most participants struggled with evaluating the prescriptions out of context of the planning process. Without a full understanding of the planning environment and park related issues and data, it is difficult to evaluate the appropriate level of specificity or detail for management prescriptions in a hypothetical context. For this reason, hypothetical examples of management prescriptions were not developed during this study to illustrate the criteria for prescriptive statements because it seemed they would not provide effective guidance.

During the multiple methods of this study, it was suggested that the confounding issue of the appropriate level of specificity for management prescriptions be dealt with by developing evaluative questions that could be used as a check for whether prescriptions were effective for individual planning projects. The following questions were suggested to aid the development of management prescriptions in terms of the appropriate level of detail. The questions include (1) Whether the parties involved have a shared understanding of the implications of implementing the prescription, and (2) Does the prescription allow for changing knowledge and resources?

In addition to dealing with the issue of specificity for management prescriptions, this study revealed other criteria for effective prescriptions. There was more agreement on these criteria, however it was difficult for participants to separate criteria for the content of prescriptions (e.g., results oriented) and criteria for the process of developing prescriptions (e.g., defensible). At an earlier stage of synthesizing the results of the prescription workshop, the criteria list was divided into the content of prescription and the process for developing prescriptions. During the written survey, this division of the criteria seemed to cause confusion, so the final list of criteria did not make a distinction between process and content. The final list of criteria has now been reviewed by a larger audience of NPS professionals through the inclusion of the criteria in updated NPS planning guidance. Currently, the final list of criteria has been well accepted by the NPS community.

This study also attempted to define which elements or variables should be included under the main topics of visitor experiences, resource conditions and levels of management for management prescriptions. During the interviews, the question of appropriate desired condition topics seemed to be difficult for participants to discuss in an interview setting due to poor recall. During the planning workshop, participants were able to give a conceptual idea of what topics should be included (e.g., more discussion of ecological processes for natural resource conditions), however specific details on desired condition topics was difficult to identify out of context of a planning process. To address this information gap, a content analysis of NPS plans and policy and other agencies' plans and planning guidance (e.g., United States Forest Service, The Nature Conservancy, Environmental Protection Agency and Parks Canada) was conducted. The content analysis sought to provide details on conditions topics related to the conceptual topics outlined during the planning workshop. The resulting proposed menu of desired condition topics was then tested with the written survey participants.

The final menu of desired condition topics is also being reviewed by a larger audience of NPS professionals through the inclusion of the criteria in updated NPS planning guidance. Currently, the final menu of desired condition topics has received some criticism. Primarily, the level of detail regarding resource conditions has been the focus of most concerns. Although most participants in the various steps of the study called for increased specificity for desired resource conditions, other NPS professionals have expressed concern that the level of specificity suggested in the menu of condition topics would require extensive data collection prior to planning efforts. As the menu is tested in future planning efforts, it would be helpful to do further comparative analyses of plans to identify the level of detail for resource conditions that is feasible for most plans.

To further refine the planning tools developed during this study, formal case studies of NPS planning projects are needed. More comparative analysis among plans and in-depth interviews with planning participants could provide a better understanding of the strengths and weaknesses of planning efforts. Further, a clearinghouse for NPS planning is needed to provide examples of successful planning processes and effective management prescriptions for illustration.

The intent of developing management prescriptions for areas, or zones, within a park is to ensure that the park's important natural and cultural resources and values are managed to achieve specific conditions based on their inherent characteristics, and that a variety of opportunities for enjoyment of park resources are directed to the most appropriate areas of the park (NPS, in development). The planning process needs to identify important resource and visitor experience elements specific to a park and then prescribe clear and unambiguous desired conditions for those elements. Taking this concept further, Cole (2000a & 2000b) has suggested that the entire wilderness system needs a system-wide vision, including definition of desired conditions for wilderness values such as being uncrowded, wild, natural and free. Currently, management for wilderness areas is comprised of numerous independent decisions by multiple land managers. Some managers are implementing use limitations to keep wilderness from being crowded, while others are avoiding restrictions to preserve visitor freedom (Cole, 2000b). This site-specific, decentralized approach to wilderness management is a recipe for mediocrity – a wilderness system that is neither highly natural, wild, uncrowded or free (Cole, 2000a, 2000b).

Whether the focus is a specific recreation area, a park, or an entire wilderness system, we need to ask whether we have defined the direction that we want, and whether we are making strides to achieve it. It is critical that we make the decisions necessary to define how these lands will be managed (Cole, 2000a). Science provides information that informs these decisions, but ultimately, people must decide what ought to be (Cole, 2001). The process of developing management prescriptions must allow for stakeholders to debate the values, characteristics and features that should be perpetuated. Once the desired conditions have been identified, they must be articulated in a way that both management and the public can understand, and anticipate the related implications.

The planning tools developed in this study are intended to meet some of the current concerns specifically related to articulation of desired conditions for resources and visitor experiences in NPS general management plans. The purpose and criteria for management prescriptions and related menu of desired condition topics will be integrated into planning guidance to aid the development of unique and effective management prescriptions for national parks. With further experience and formalized case studies, the approach to articulating management prescriptions may change and future guidance documents will be updated.

Conclusion

Effective management prescriptions are at the core of operationalizing park planning and decision making, and many recreation management problems, both social and resource related, can be resolved by improving these prescriptive statements. Continued effort is needed to understand the development, application, and important properties of management prescriptions for national parks. To further refine the planning tools developed during this study, formal case studies of NPS planning projects are needed. Through additional investigations, enhanced knowledge regarding the role and characteristics of management prescriptions will help managers develop more relevant and effective management prescriptions and implement more effective management actions.

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CHAPTER V. SUMMARY AND CONCLUSIONS

Summary of Findings

Public land management agencies are charged with accommodating recreational visitation while ensuring protection of natural and cultural resources and processes. Decisions about appropriate management of public lands are extremely complex and steeped in value choices. National Park Service (NPS) policy requires the development of management plans for all park units to ensure that park managers and stakeholders have a clearly defined understanding of the types of resource conditions, visitor experiences, and management conditions that will best achieve NPS' mandate to preserve resources unimpaired for the enjoyment of future generations.

The development of management prescriptions or statements of desired conditions in NPS management plans helps focus management priorities and provide a defensible link between actions, the park's purpose and the NPS' mission and goals.   This research was undertaken due to the importance of this step in the planning process and the lack of attention that has been paid to providing guidance for developing *effective* prescriptive statements for social, resource and management conditions. The goal of this dissertation was to explore opportunities for additional guidance on the development of management prescriptions.

To fill some of the knowledge gaps related to development of management prescriptions, this dissertation set out to (1) evaluate the current perception of the purpose of management prescriptions by public land management professionals; (2) develop criteria and other tools to guide the development of management prescriptions based on the experiences of public land management professionals; and (3) test an alternative method for collecting visitor preference data regarding social, resource and managerial conditions to inform development of management prescriptions. The studies included in this research effort focused on the planning and management processes of the National Park Service.

This dissertation research was composed of two main projects. First, a stated choice visitor study and accompanying verbal protocol assessment was conducted in three different settings in Acadia National Park to examine visitor preferences for social, resource and management conditions. Second, a qualitative research study was conducted with public land management professionals to gain insight on the development of prescriptions for NPS general

management plans to facilitate future planning efforts. These projects provided the basis for the analysis and discussion found in this dissertation.

The first paper presents study findings from a stated choice survey and verbal protocol assessment at Jordan Pond, in Acadia National Park, in terms of visitor preferences for tradeoffs among social, resource and management conditions. The purpose of the paper was to (1) examine visitor preferences for tradeoffs among social, resource and management conditions, and (2) gain an improved understanding of considerations made by visitors in expressing preferences for tradeoffs among social, resource and management conditions.

The results of this stated choice study indicate that visitors to Jordan Pond are likely to accept high levels of encounters with other visitors to protect opportunities to access the area. In addition, Jordan Pond visitors would accept, and most likely support, high levels of development to protect resources as well as increase access opportunities for a diverse visitor population. Further, the verbal protocol assessment, conducted in conjunction with the stated choice survey, provides evidence that visitors were considering the attributes and levels presented in the survey in terms of tradeoffs. The verbal protocol demonstrated a strong emphasis by visitors on safety and accessibility concerns at Jordan Pond, providing additional support for the acceptability of higher levels of development in this particular area of the park.

The second paper analyzes the Acadia National Park study findings in terms of the differences among visitor preferences in three distinct recreation settings in the park. The three study areas included Jordan Pond on Mount Desert Island, Isle au Haut, and Little Moose Island off the Schoodic Peninsula. These areas have different natural resource settings, visitor activities, use levels and facility developments. The purpose of the second paper was to improve planning and decision making for public land management by exploring visitor preferences for social, resource and management conditions in different recreation settings.

Study results indicate that visitors to the Jordan Pond area of Acadia National Park are more in favor of development options for managing trails than visitors to the other locations. Visitors to Little Moose Island and Isle au Haut expressed stronger support for keeping encounter rates low and trail conditions primitive than visitors to Jordan Pond. Finally, all visitors would prefer low levels of resource impacts. In summary, it is expected that visitors to Acadia National Park are willing to tradeoff unlimited access for less development in more primitive areas of the park. However, in areas that accommodate a more diverse visitor

population, access is a high priority and higher development is seen as a positive management action. These differences for preferences between recreation settings highlights the need to fully understand management issues and select management strategies that are both effective as well as acceptable to visitors that may frequent a particular area of the park.

The third paper reexamines the role of management prescriptions for park management planning and investigates tools for facilitating development of management prescriptions. The purpose of the third paper was to address some of the current concerns specifically related to articulation of desired conditions for resources and visitor experiences in NPS general management plans. The research investigated (1) how public land management professionals perceive the purpose of defining management prescriptions in relation to park planning and decision making; (2) how public land management professionals define effective management prescriptions; and (3) what desired condition elements related to visitor and resource management are most relevant for National Park Service general management plans.

The investigation on the purpose of management prescriptions found that public land management professionals perceive management prescriptions to be the foundation of NPS general management plans. Defining desired conditions provides long term direction and allows park managers to be proactive about the type of resource conditions and associated visitor experiences that are appropriate to maintain the integrity of natural and cultural resources and a diversity of visitor experiences. By defining desired conditions, the park and the public are forced to get out of an operational mode and into the process of articulating values and setting goals, resulting in an increased understanding of park goals among all stakeholders. It was also suggested that this process improved NPS accountability by focusing management priorities and providing a defensible link between current and future management actions.

Related to the analysis of criteria for management prescriptions, it was noted that one of the most difficult aspects of defining prescriptions is articulating desired conditions with sufficient specificity to be meaningful, while preserving management flexibility over the life of a general management plan. Regarding the confounding issue of the appropriate level of specificity for management prescriptions, this research did not reveal a formula for the ideal level of planning detail. Rather, evaluative questions were suggested to aid the development of management prescriptions in terms of the appropriate level of detail. The questions include (1)

do the parties involved have a shared understanding of the implications of implementing the prescription, and (2) does the prescription allow for changing knowledge and resources?

With further consideration, numerous other criteria were also defined as important for guiding effective management prescriptions. Prescriptions need to include clearly defined desired conditions for *fundamental* resources and values, those resources and values that are fundamental to achieving a park's purpose. Prescriptions need to be outcome based, focused on the "what" not the "how" of management. Prescriptions need to be defensible, based on best available information, as well as responsive to the full range of stakeholder input. Finally, prescriptions need to focus on the long term, 15-20 years, and be holistic, reflecting the larger social, political, and ecological context of park resources and values.

The study also found that existing prescriptions in general management plans are not adequate in their comprehensive treatment of park resources and visitor experiences. Most often, general management plans are perceived as "visitor services" plans, since prescriptions are exclusively focused on visitor uses and development with little, if any, discussion of larger resource issues or interpretive themes. Also, it was noted that there was a lack of consistency between plans in terms of the important elements that should be included in general management plans. To provide guidance on the topics of desired conditions that should be included in general management plans, a suggested menu of desired condition topics was developed.

Regarding natural resource conditions, the menu of desired condition topics focuses attention on defining desired conditions from an ecological perspective. The menu outlines major ecological systems and processes that should be considered when developing management prescriptions. Regarding cultural resources, the menu outlines the major cultural resource categories (e.g., archaeological resources, cultural landscapes, ethnographic resources, historic and prehistoric structures and ruins, and museum collections) that are required for consideration by NPS policy. On the topic of social setting conditions, the menu includes topics such as visitor experiences uniquely related to the park's natural and cultural resources, sharing cultural heritage with others, education and interpretation programs and services, and opportunities for recreation activities that are dependent on the park's resources. Finally, the menu includes a section on management conditions, including the level and character of development, level of emphasis on research, amount of services and amenities provided, and modes of circulation and access.

Management Implications

In general, this dissertation has demonstrated that (1) insight from experienced professionals can increase the understanding of the purpose and development process for management prescriptions; (2) public land management professionals perceive management prescriptions that define social, resource and management conditions as both an important and complex step in the planning process; and (3) due to the complexity and importance of this step in the planning process, multiple sources of information from visitors and stakeholders can provide additional insight on appropriate desired conditions, including related tradeoffs.

The planning tools described in Chapter IV are a result of the current experience and knowledge of a multi-disciplinary group of NPS staff that have been involved in numerous planning efforts. It is important to gain insight from professionals who have experience in this process to possibly mitigate future impediments and share information on useful and successful methods. The purpose and criteria for management prescriptions and related menu of desired condition topics will be integrated into planning guidance to aid the development of unique and effective management prescriptions for national parks.

Planning staffs can use the formal definition of the purpose of management prescriptions as an education tool when initiating this step in the planning process. This tool would clarify the rationale that will guide the development of prescriptions, as well as the level of importance placed on this component of the planning process. The list of criteria can serve as a checklist against which prescriptive statements can be evaluated to ensure that they are as effective as possible. The menu of desired condition topics provides an extensive array of examples to facilitate discussion on important conditions for individual parks. The menu of conditions and related descriptions should be used as discussion points only, rather than as strict guidelines for what conditions are defined. With further experience and formalized case studies, the approach to articulating management prescriptions may change and future guidance documents will need to be updated.

Before defining desired conditions for a park, planners and managers need to find multiple means for assessing visitor preferences, based on the information needs of the planning process. Also, when seeking input for defining desired conditions, it is critical to acknowledge the relationship among the multiple dimensions of the recreation setting and seek input that reflects these tradeoffs (Cole, 2001). The stated choice study at Acadia National Park outlined in

Chapters II and III provides insight on how visitors think these tradeoffs should be balanced and provides one mode of support for defining desired conditions for management of an area, as well as supporting decisions on specific management actions.

The research at Acadia National Park suggests there are distinct differences in preferences for recreation setting conditions in particular areas of the park, which may influence public support for prescribed desired conditions. The stated choice model used in this study can help managers have a general understanding of the importance of particular attributes for various areas that have been included in the model (Schroeder & Louviere, 1999). The stated choice method should be used as one of many valuable tools in gaining a richer vocabulary on geographically specific desired conditions (Manning, 2003).

Further, the results of the verbal protocol assessment, presented in Chapter II as part of the stated choice study, provides evidence that visitors can consider recreation setting attributes in terms of tradeoffs. Identification of visitors' considerations related to the tradeoffs provides more insight into what conditions are important to respondents regarding the recreation settings. This information would be useful during the planning process to further identify the desired character of a particular area.

Future Directions of Research

This dissertation has examined the perceived purpose and development of management prescriptions as defined by public land management professionals with experience in NPS general management plans. Further, this dissertation examined the use of the stated choice method as one tool to seek visitor input for defining desired conditions. This dissertation should be considered a first step in raising awareness about the importance of defining effective management prescriptions and the multiple planning tools that may be helpful to this step in the planning process. Further evaluation of tools and methods that facilitate and improve implementation of this component of the decision-making process is needed.

Effective management prescriptions are at the core of operationalizing park planning and decision making, and many recreation management problems, both social and resource related, can be resolved by improving these prescriptive statements. Continued effort is needed to understand the development, application, and important properties of management prescriptions for national parks. To further refine the planning tools developed during this study, formal case

studies of NPS planning projects are needed. More comparative analysis among plans and in-depth interviews with planning participants could provide a better understanding of the strengths and weaknesses of planning efforts. Further, a clearinghouse for NPS planning is needed to provide examples of successful planning processes and effective management prescriptions for illustration. Through additional investigations and communication, enhanced knowledge regarding the role and characteristics of management prescriptions will help managers develop more relevant and effective management prescriptions and implement more effective management actions.

Further, visitor preference surveys, including stated choice studies, can provide us with quantitative, generalized data, but these data fail to capture the range of human perceptions and preferences for management of the landscape. However, when combined with other methods of input, stated choice modeling can complement and expand the depth of knowledge regarding desired conditions. The ideal implementation of the stated choice method would include visitor interviews or focus groups that would provide insight on appropriate variables to be used in the survey. It is important to acknowledge the multidimensional nature of recreation settings and develop survey instruments that are reflective of the park's purpose and its significance to visitors. In addition, sharing of the quantitative and qualitative data with focus groups, park staff, and public work groups would allow the results to be interpreted in relation to the values, meanings and issues of a park.

Conclusion

It is important to recognize that changes in the nature of recreation experiences and resource conditions will occur, regardless of whether they have been anticipated or sanctioned by managers. Visitor use planning for public lands helps to minimize unacceptable impacts and promote high quality visitor experiences by establishing desired conditions for a natural area.

Management prescriptions that describe desired conditions have become widely accepted as an important component of public land management plans, but very little effort has been spent on evaluating and learning about this part of the planning and decision-making process. This research included a reexamination of the role of management prescriptions for park management planning and investigated tools for facilitating development of management prescriptions. In addition, this research included an alternative method for collecting visitor preference data

regarding social, resource and managerial conditions to inform development of management prescriptions. It is hoped that this dissertation brings awareness of the importance of this step in the planning process and the need for continuing evaluation and guidance related to the development of management prescriptions.

Reference List

Cole, D. (2001). Visitor use density and wilderness experiences: A historical review of research. *Visitor use density and wilderness experience: Proceedings* (pp. 11-20). Ogden, UT: Department of Agriculture, Forest Service, Rocky Mountain Research Stations.

Manning, R. (2003). What to do about crowding and solitude in parks and wilderness? A reply to Stewart and Cole. *Journal of Leisure Research, 35*(1), 107-119.

Schroeder, H., & Louviere, J. (1999). Stated choice models for predicting the impact of user fees at public recreation sites. *Journal of Leisure Research, 31*(3), 300.

Acadia National Park
Visitor Survey
2002

Version_____

Location_____

Date_____

Interviewer_____

Detailed Instructions:

To help guide decisions about managing Acadia National Park, we would like to know how you feel about potential tradeoffs among the resource, social and managerial conditions you experienced in this area of the Park today. We would like you to answer a series of questions that deal with such tradeoffs. Each question describes two recreation settings. The recreation settings are contained in a binder provided to you by the survey attendant. For each question, we would like to know which setting you would prefer <u>in this particular area</u> of Acadia National Park. Please consider <u>only the area in which you just visited</u>. We would also like to know how strongly you would prefer the setting you chose.

For each of the following questions:

Circle <u>one number on the left side of the scale</u> from 1 (moderately prefer setting A) to 5 (strongly prefer setting A) **<u>if you prefer setting A to setting B</u>**.

OR

Circle <u>one number on the right side of the scale</u> from 1 (moderately prefer setting B) to 5 (strongly prefer setting B) **<u>if you prefer setting B to setting A</u>**.

Compare only the two settings presented in the question. <u>Please do not compare settings in one question to settings in a different question</u>.

For Questions 1-8, please refer to the binder of recreation settings provided by the survey attendant. You will record your responses beginning on the next page of this questionnaire. An example of how a respondent might complete a question is located on the first page of the binder.

1.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 1									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

2.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 2									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

3.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 3									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

4.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 4									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

5.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 5									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

6.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 6									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

7.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 7									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

8.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 8									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

Please continue to the next page for some additional questions.

9. In the preceding exercise we asked you to evaluate a series of alternative settings and to make some judgments about how to balance potential tradeoffs among resource, social and managerial conditions of the recreation setting in Acadia. We would like to know how well you think this exercise has worked. Using the scale on the right, please indicate the extent to which you agree or disagree with the following statements. (*Circle one number for each statement.*)

	LEVEL OF AGREEMENT					
	Strongly disagree	Disagree	Neutral	No Opinion	Agree	Strongly agree
a. I understood the questions I was asked.	-2	-1	0	0	1	2
b. The alternatives presented realistically represent different recreation settings.	-2	-1	0	0	1	2
c. It was difficult to choose between alternative settings.	-2	-1	0	0	1	2
d. The answers I gave to these questions accurately represent my feelings about preferred conditions in this area of Acadia National Park.	-2	-1	0	0	1	2

Questions 10 to 12 ask you to evaluate some aspects of **the area you just visited** in Acadia.

10. How did the level of site development (e.g., use of gravel, wood planking or stepping stones) you saw on the trail you just visited compare with the level of development you thought you would see? (*Please circle the appropriate number*).

    1   A lot less than expected
    2   Less than expected
    3   About as expected
    4   More than expected
    5   A lot more than expected
    6   Had no expectations about the level of development to be seen

11. How did the amount of evidence of human use (e.g., informal trails leaving the main trail, trail widening) you saw on the trail you just visited compare with what you thought you would see? (*Please circle the appropriate number*).

    1   A lot less than expected
    2   Less than expected
    3   About as expected
    4   More than expected
    5   A lot more than expected
    6   Had no expectations about the amount of evidence that would be seen

12. Please rate the importance you place on each of the following items for a visit <u>to this area</u> of Acadia. (*Circle one number for each item*).

	IMPORTANCE				
	Not at all important	Slightly important	Moderately important	Very important	Extremely important
a. The ability to gain access to this area.	1	2	3	4	5
b. Number of other groups encountered per day while hiking.	1	2	3	4	5
c. Presence and extent of visitor created trails (trails leaving the main trail, created by visitors).	1	2	3	4	5
d. Condition of official trails (e.g., level of muddiness, signs of erosion and/or widening).	1	2	3	4	5
e. Level of development of trail surface (e.g., use of gravel or wood planking).	1	2	3	4	5

Lastly, we would like to ask you some questions about your background that will help us compare your answers to those of other visitors.

13. Which of the following activities did you participate in on your visit to **this area** of Acadia? (*Circle all numbers that apply*.)

    1   Hiking
    2   Biking
    3   Camping
    4   Picnicking
    5   Birdwatching
    6   Other (Please specify: _____)

14. Including this trip, approximately how many times have you hiked in **this area** of Acadia National Park?

    Number of hikes_____

15. Besides this trip to Acadia National Park, how many times have you been hiking in a protected area (e.g., National Park or Forest, State Park, Wildlife Refuge) in the last 12 months?

    Number of hikes_____

16. a. Do you reside within 10 miles of **this area** of Acadia National Park? (*Circle one number*.)

    1   Yes
    2   No (Skip to question 17)

    b. If you do reside within 10 miles of **this area**, what is your residential status? (*Circle one number*.)

    1   Year round resident
    2   Summer season resident
    3   Not a resident

17. a. If you are from the United States, what state do you live in?

    State of residence: _____

    b. If you are not from the United States, what country do you live in?

    Country of residence: _____

18. Are you (*circle one number*)?

    1   Female
    2   Male

19. What year were you born?

    19_____ _____

20. What is the highest level of formal schooling you have completed?
   (*Circle the appropriate number.*)

    1 2 3 4 5 6 7 8 9 10 11 12   13 14 15 16   17 18 19 20 21 22 23 24+
    (Elementary thru High School)   (College/Vocational)   (Graduate/Professional)

Thank you for your time and consideration in completing this survey. Please give your completed questionnaire back to the survey attendant.

APPENDIX B: ACADIA NATIONAL PARK VISITOR SURVEY WITH VERBAL PROTOCOL RESPONSE FORM

Acadia National Park Visitor Survey
Verbal Protocol
2002

<div align="right">

OMB Approval #1024-0224 (NPS #02-021)
Expiration Date: 03/31/2003

Version_____

Location_____

Date_____

Interviewer_____

</div>

Section A. In this section we would like to tape record your responses to a series of questions concerning your visit to this section of Acadia today. All of your answers are strictly confidential and the tape recording of your responses will be destroyed at the end of the study. **Please tell the survey administrator if you are willing to participate in the taped interview.** Please follow along on the questionnaire as I read you the instructions for the questionnaire.

In this section of the questionnaire, we are interested in finding out what you think about when you answer questions concerning your visit to this area of Acadia today. In order to do this I am going to ask you to THINK ALOUD as you formulate an answer to each of the remaining questions. What I mean by think aloud is that I want you to tell me EVERYTHING you are thinking from the time you first see each question until you give an answer. I would like you to talk aloud CONSTANTLY from the time you begin this section of the questionnaire until you have given your answer to the final question in this section of the questionnaire. *Please note which question you are responding to as you move through the survey.* The second section of the questionnaire asks some questions about your background, which you can answer without thinking aloud.

Please say whatever you are thinking even if you think it is not relevant to the question. I don't want you to try to plan out what to say or try to explain to me what you are saying. If you are silent for any long period of time I will remind you to talk. Do you understand what I want you to do?

I would like to present you with a couple of warm-up questions. Please say aloud everything you are thinking as you answer the following question:

1. How has the weather been on your trip to Acadia National Park today? (*Circle one number only.*)

1. Cloudy
2. Rainy
3. Sunny
4. A little of everything
5. Other_____

There is one more practice question for you to complete before proceeding to the remainder of the questionnaire. Please continue to say aloud everything you are thinking as you formulate and provide an answer to the following question:

2. How much of a problem do you think the following issues are in this area of Acadia National Park? (*Circle one number for each item.*)

	LEVEL OF AGREEMENT				
	Not a problem	Small problem	Moderate problem	Big problem	Don't know
a. Impacts to soil and vegetation	1	2	3	4	5
b. Too many visitors	1	2	3	4	5
c. Too much development	1	2	3	4	5
d. Not enough development	1	2	3	4	5
e. Not enough recreation opportunities	1	2	3	4	5
f. Lack of information/education	1	2	3	4	5

For the remainder of this section of the questionnaire, please say aloud everything you are thinking as you formulate and provide an answer to each of the following questions. Remember to note which question you are responding to in the survey.

Detailed Instructions:

To help guide decisions about managing Acadia National Park, we would like to know how you feel about potential tradeoffs among the resource, social and managerial conditions you experienced in this area of the Park today. We would like you to answer a series of questions that deal with such tradeoffs. Each question describes two recreation settings. The recreation settings are contained in a binder provided to you by the survey attendant. For each question, we would like to know which setting you would prefer <u>in this particular area</u> of Acadia National Park. Please consider <u>only the area in which you just visited</u>. We would also like to know how strongly you would prefer the setting you chose.

For each of the following questions:

Circle <u>one number on the left side of the scale</u> from 1 (moderately prefer setting A) to 5 (strongly prefer setting A) **if you prefer setting A to setting B**.

OR

Circle <u>one number on the right side of the scale</u> from 1 (moderately prefer setting B) to 5 (strongly prefer setting B) **if you prefer setting B to setting A**.

Compare only the two settings presented in the question. <u>Please do not compare settings in one question to settings in a different question</u>.

For Questions 1-8, please refer to the binder of recreation settings provided by the survey attendant. You will record your responses beginning on the next page of this questionnaire. An example of how a respondent might complete a question is located on the first page of the binder.

1.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 1									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

2.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 2									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

3.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 3									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

4.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 4									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

5.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 5									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

6.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 6									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

7.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 7									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

8.

PLEASE CIRCLE **ONE** NUMBER FOR QUESTION 8									
5	4	3	2	1	1	2	3	4	5
Strongly Prefer A			Moderately Prefer A		Moderately Prefer B			Strongly Prefer B	

Please continue to the next page for some additional questions.
YOU CAN STOP THINKING ALOUD NOW.

9. In the preceding exercise we asked you to evaluate a series of alternative settings and to make some judgments about how to balance potential tradeoffs among resource, social and managerial conditions of the recreation setting in Acadia. We would like to know how well you think this exercise has worked. Using the scale on the right, please indicate the extent to which you agree or disagree with the following statements. (*Circle one number for each statement.*)

	LEVEL OF AGREEMENT					
	Strongly disagree	Disagree	Neutral	No Opinion	Agree	Strongly agree
a. I understood the questions I was asked.	-2	-1	0	0	1	2
b. The alternatives presented realistically represent different recreation settings.	-2	-1	0	0	1	2
c. It was difficult to choose between alternative settings.	-2	-1	0	0	1	2
d. The answers I gave to these questions accurately represent my feelings about preferred conditions in this area of Acadia National Park.	-2	-1	0	0	1	2

Questions 10 to 12 ask you to evaluate some aspects of **the area you just visited** in Acadia.

10. How did the level of site development (e.g., use of gravel, wood planking or stepping stones) you saw on the trail you just visited compare with the level of development you thought you would see? (*Please circle the appropriate number*).

    1   A lot less than expected
    2   Less than expected
    3   About as expected
    4   More than expected
    5   A lot more than expected
    6   Had no expectations about the level of development to be seen

11. How did the amount of evidence of human use (e.g., informal trails leaving the main trail, trail widening) you saw on the trail you just visited compare with what you thought you would see? (*Please circle the appropriate number*).

    1   A lot less than expected
    2   Less than expected
    3   About as expected
    4   More than expected
    5   A lot more than expected
    6   Had no expectations about the amount of evidence that would be seen

12. Please rate the importance you place on each of the following items for a visit to this area of Acadia. (*Circle one number for each item*).

	IMPORTANCE				
	Not at all important	Slightly important	Moderately important	Very important	Extremely important
a. The ability to gain access to this area.	1	2	3	4	5
b. Number of other groups encountered per day while hiking.	1	2	3	4	5
c. Presence and extent of visitor created trails (trails leaving the main trail, created by visitors).	1	2	3	4	5
d. Condition of official trails (e.g., level of muddiness, signs of erosion and/or widening).	1	2	3	4	5
e. Level of development of trail surface (e.g., use of gravel or wood planking).	1	2	3	4	5

Lastly, we would like to ask you some questions about your background that will help us compare your answers to those of other visitors.

13. Which of the following activities did you participate in on your visit to **this area** of Acadia? (*Circle all numbers that apply*.)

    1   Hiking
    2   Biking
    3   Camping
    4   Picnicking
    5   Birdwatching
    6   Other (Please specify: _____)

14. Including this trip, approximately how many times have you hiked in **this area** of Acadia National Park?

    Number of hikes_____

15. Besides this trip to Acadia National Park, how many times have you been hiking in a protected area (e.g., National Park or Forest, State Park, Wildlife Refuge) in the last 12 months?

    Number of hikes_____

16. a. Do you reside within 10 miles of **this area** of Acadia National Park? (*Circle one number*.)

    1   Yes
    2   No (Skip to question 17)

    b. If you do reside within 10 miles of **this area**, what is your residential status? (*Circle one number*.)

    1   Year round resident
    2   Summer season resident
    3   Not a resident

17. a. If you are from the United States, what state do you live in?

    State of residence: _____

    c. If you are not from the United States, what country do you live in?

    Country of residence: _____

18. Are you (*circle one number*)?

    1   Female
    2   Male

19. What year were you born?

       19_____ _____

20. What is the highest level of formal schooling you have completed?
    (*Circle the appropriate number.*)

    1 2 3 4 5 6 7 8 9 10 11 12   13 14 15 16   17 18 19 20 21 22 23 24+
    (Elementary thru High School)   (College/Vocational)   (Graduate/Professional)

Thank you for your time and consideration in completing this survey. Please give your completed questionnaire back to the survey attendant.

APPENDIX C: SEMI-STRUCTURED INTERVIEW SCHEDULE FOR NPS INTERVIEWS (2001)

An Exploration of the Role of Management Prescriptions in
NPS General Management Plans

Personal Background

1. Describe your primary occupation. What are your main responsibilities?
2. How long have you been in your current position?
3. How many times would you say you've been involved in a visitor capacity decision-making process? Can you give me some details about your role and level of involvement in this/these process(es)?

Significance of Management Prescriptions to Visitor Capacity Decision Making

1. How would you describe the current state of visitor capacity decision-making (e.g., how do you perceive most parks are dealing with the issue?) Would you describe the concept of visitor capacity as being beneficial to the field of recreation management – why or why not?
2. How would you define visitor capacity with regards to meeting the spirit and purpose of the National Park and Recreation Act of 1978 that requires NPS general management plans to address carrying capacity? (e.g., what is the most important end product - numerical capacity, indicators/standards, DFCs, etc.)
3. To what degree do you believe the visitor capacity frameworks (e.g., Limits of Acceptable Change, Visitor Experience and Resource Protection) have been institutionally accepted and utilized in the National Park System?
4. Describe the level of necessity of these processes for adequately addressing capacity decisions?
5. What are your thoughts on the most important aspects of defining visitor capacity for an area?
6. The National Park Service's 2001 management policies state that desired resource and visitor experience conditions are the "foundation for carrying capacity analysis and decision making" (81). Do you agree with this statement and why or why not? (If they agree) How do DFCs (the statements and the process of developing them) assist other parts of the decision making process? Give me an example from your experiences of how they served an important function.

Defining "Well-Formulated" Management Prescriptions

1. Can you give me some adjectives that would describe "well-formulated" management prescriptions? Can you define these adjectives for me and tell me why they are important? Do you think that other public land management professionals (i.e. managers, planners, resource specialists) would think these criteria are equally as important as you do? Can you

think of any other criteria that may be uniquely important to one or more of these types of professionals?

2. Someone has said that "the scientific community needs to help define recreation experiences and segments of visitors much more substantially in order for managers to make decisions that are rational, defensible, and understood by the public…There is a need to move beyond planning and managing for general activities and to move beyond ambiguous experiential phrases." What would you say to them? Can you explain in more detail what you think this person means? What are some changes that you think they would suggest for the current process of developing management prescriptions? Specifically, what are some ways that science may be able to assist in defining recreation experience and natural resource conditions?

3. What are some particular aspects of the recreation experience that you would consider really important to describe in the general management plan (ask for clarification and reasons)? What are some particular aspects of natural resource conditions that you would consider really important to describe in the general management plan (ask for clarification and reasons)?

4. Can you give me an example or two of what you would consider to be "well-formulated" management prescriptions? What do you feel are the critical elements of these statements?

Management Prescription Development Process

1. Can you tell me about your experience in developing some management prescriptions for a particular park? What were the steps in the process? Were there any steps you found particularly useful and why? What were the critical pieces of information/data used during the process? Did you use any particular methods for gaining input? How would you characterize the process (i.e. smooth, difficult)? Were there any struggles throughout the process? Would you ultimately define the process as "successful" or "unsuccessful" and why?

2. In your opinion, are there any difficult aspects of defining management prescriptions, and if so, what are they? Have you seen any particular tools/methods employed to directly combat these difficulties? If not, can you think of some that may expedite the process?

3. Based on your experience, can you think of any ways that the process of developing management prescriptions may be improved by (whatever position they hold)? And how can researchers assist in the facilitation of the process (through research or their involvement)?

Virginia Tech

1872

VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

Department of Forestry (0324)

College of Natural Resources
304 Cheatham Hall, Blacksburg, Virginia 24061
540-231-3596 Fax: 540-231-3698 E-mail: kcahill@vt.edu

APPENDIX D: COVER LETTER TO MANAGEMENT PRESCRIPTION SURVEY PARTICIPANTS

June 27, 2002

Dear Workshop Participants:

The May 13-15 workshop on management prescriptions produced valuable information to assist with the update on Director's Order 2. As I discussed with many of you, I am in the process of developing my dissertation research in relation to the topic of management prescriptions. To further the DO-2 revision effort, I have proposed a second phase of research related to some of the issues that we discussed in the meeting. The purpose of the additional research is to clarify and refine some of the "big" ideas generated during the workshop. I anticipate that this refined information will be included in the updated DO-2 guidelines as they relate to management prescriptions.

I know you have already put forth a great deal of effort regarding this topic, but I am hoping you will agree to invest some additional thought and energy. I am proposing a survey, which includes two separate questionnaires, that will ask you to respond to some of the synthesized material from the workshop. I anticipate that your time commitment for each questionnaire will not exceed one hour.

The topics in the survey include refining the purpose of management prescriptions, developing a checklist of criteria for effective prescriptive statements, and generating a list of desired future conditions that are relevant to the NPS system. In the first questionnaire, I ask you to review some of the synthesized material from the workshop and provide feedback. Your responses will be incorporated with the input from other survey participants. This revised information will then be sent to you in a second questionnaire for additional review. Upon receipt of your final comments, the information will be analyzed and organized into a final report for the NPS. The results of the study will also be an integral part of my dissertation.

I would sincerely appreciate your continued involvement in this next phase of study on management prescriptions. The first questionnaire is attached to this e-mail. Your response will be treated confidentially. Please provide responses in the electronic document and return the questionnaire by July 22, 2002 via e-mail (instructions for returning the questionnaire are included in the survey). If you do not wish to participate, please send a note indicating this via e-mail to kcahill@vt.edu. Please e-mail or call me at (540) 961-5635 with any questions regarding the study. I look forward to working with you further on this topic.

Thank you.

Sincerely,
Kerri Cahill
Doctoral Candidate
Virginia Tech

Planning Guidelines to Aid the Development of Management Prescriptions

Virginia Tech
Department of Forestry
Blacksburg, Virginia 24060

Questionnaire Instructions:

In the following pages of this questionnaire, you will find a list of statements and descriptions that relate to the purpose of management prescriptions and criteria for writing and selecting effective management prescriptions. In addition, guidance for defining desired future conditions is provided. This information was generated from a comprehensive synthesis of the information collected during the May 13-15 workshop on management prescriptions that you attended, along with review of additional materials. Other sources of information that were reviewed included interviews with NPS staff, a written survey of NPS superintendents, journal articles, management policies, management plans, and related research papers.

From your perspective and experience, please review and critique the purpose statements, criteria, and menu of desired future conditions. Your review is necessary to remove redundancy, amend omissions, and clarify descriptions. Please insert your comments into the electronic version of this document in response to specific questions at the end of each section. After reviewing and critiquing the three sections of management prescription guidelines, please respond to the additional questions in section four of the survey.

When you are finished with the questionnaire, please save the document with your initials on the end of the existing file name: **Management Prescriptions Survey_*Your Initials*.** Please attach the document to e-mail and send it to kcahill@vt.edu by July 22, 2002.

Please continue to the next page to begin Section One of the survey.

SECTION 1

Purpose of Management Prescriptions

The objective of this section is to review and refine statements that define the purpose of management prescriptions. These statements were developed based on feedback from the workshop and through additional research. Please review the material and answer the questions at the end of the section. Insert your responses below each question.

The purpose of management prescriptions includes:

VISION: Provide a long-term vision for park resources and visitor experiences – What is important to achieve and where we want to achieve it.

SUPPORT: Provide an opportunity to increase understanding and gain wider support for management goals and actions from park staff, relevant stakeholders and the public.

ACCOUNTABILITY: Provide a foundation for choosing among possible management alternatives and actions – Establish an audit trail.

PRIORITIES: Provide direction for prioritizing the use of park resources.

CONSISTENCY: Connect park mission, laws, and mandates to on-the-ground management.

LINKAGES: Unify management of park resources across time and space, both inside and outside park boundaries.

Please answer these questions and provide any other thoughts below.

1. Does the list above fully capture the purpose of management prescriptions? If not, please provide any additions that need to be made and provide an explanation.
   (Please insert your response here.)
2. Could anything in this list be omitted? If so, please list the topic to be omitted and provide an explanation.
   (Please insert your response here.)
3. Do the purpose statements need clarification or revision? If so, what changes would you make?
   (Please insert your response here.)
4. Do the labels supplied adequately reflect the intent of the statement? If not, what changes would you make?
   (Please insert your response here.)

SECTION 2

Criteria for Management Prescriptions

The objective of this section is to review and refine criteria for effective management prescriptions. Criteria are provided for prescription statements, as well as the process for developing prescriptions. These criteria were developed based on feedback from the workshop and through additional research. Please review the material and answer the questions at the end of the section. Insert your responses below each question.

Management prescription statements should be:

- **Specific** – Clearly worded and detailed enough to indicate implications and provide support for decisions, as well as be understood by park staff and the public. Include sufficient detail for impact and cost analyses, as well as subsequent levels of planning.

- **Comprehensive** – Define the multiple types and attributes of visitor experiences beyond use levels and types. Define ecological processes and functions beyond specific static resource conditions. Include description of desired future conditions for critical/significant resources as defined by park significance statements, mandates and laws and inventory analyses.

- **Flexible** – General enough to preserve flexibility for decisions on appropriate conditions over the long term.

- **Outcome based** - Focus on goals (visitors' as well as park's) rather than issues - the "what, not the how."

- **Positive** – Define desired resource conditions and visitor experiences in positive language that motivates action.

- **Future Oriented** -Focus on a timeframe longer than the general management plan – should be a multi-decade time frame.

- **Consistent** - Stem from and be grounded in the agency's mission and mandates, as well as the park's purpose and significance guidelines. Ensure that parkwide management prescriptions are applicable to all areas.

The development process for management prescriptions should be:

- **Inclusive** – Involve the public early in the process and clearly communicate the intent of the process and product to ensure full understanding and support. Involvement needs to go beyond review to more collaborative methods.

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- **Contextual** – Consider the relationship among resources and experiences between adjacent zones as well as outside park boundaries – Reflect on the larger social, political and ecological context and make linkages.

- **Integrated** - Integrate natural resources, cultural resources and visitor experiences – be holistic in definition.

- **Resource based** – Define desired visitor experiences, activities and infrastructure based on cultural and natural resource goals.

- **Defensible** – Review and include best available information. Investigate the latest knowledge on best management practices. Consult with others not involved in developing prescriptions to test whether prescriptions clearly convey desired future conditions. Explain the rationale that guided development of prescriptions.

Please answer these questions and provide any other thoughts below.

5. Does the list above fully capture the necessary criteria for effective management prescriptions? If not, please provide any additions that need to be made and provide an explanation.
(Please insert your response here.)

6. Could anything in this list be omitted? If so, please list the topic to be omitted and provide an explanation.
(Please insert your response here.)

7. Do the descriptions of the criteria need clarification or revision? If so, what changes would you make?
(Please insert your response here.)

8. Do the labels supplied adequately reflect the intent of the statement? If not, what changes would you make?
(Please insert your response here.)

SECTION 3

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Guidance for Defining Desired Future Conditions

One of the major concerns and discussion points in the material reviewed for this survey is that existing prescriptions are not adequate with regards to their comprehensive treatment of park resources and visitor experiences. For instance, it was often mentioned that prescriptions are exclusively focused on visitor uses and development with little, if any, discussion of larger resource issues or interpretive themes. The objective of this section is to provide some guidance on the breadth of conditions that should be explored when developing prescriptions.

To aid the comprehensive treatment of desired future conditions, a menu of possible conditions was created. The menu was developed based on feedback from the workshop and through additional research. It is intended to help guide the development of management prescriptions for conditions of the social and resource setting, and related management. The purpose of the menu is to provide an extensive array of examples to facilitate discussion on important conditions for individual parks. The menu of conditions and related descriptions should be used as discussion points only, rather than as strict guidelines for what conditions are defined. The desired conditions may be included as parkwide prescriptions and/or zone specific prescriptions.

The menu is not intended to be exhaustive, but rather to highlight those conditions that are generally relevant for the NPS system. Relevance of prescriptive statements is defined as their importance for management decision-making as well as their general applicability throughout the NPS system. It is expected that there will be many conditions that are highly relevant to individual parks due to geography and the park's purpose, but the intent of this study is to provide a menu of potential conditions that are generally relevant to the NPS system.

The menu of desired future conditions is organized by social setting, resource setting and management conditions. Please review the material and answer the questions at the end of each section. Insert your responses below each question.

Social Setting Conditions

Visitor Use Types and Levels
- **Level and type of use:** Define the most appropriate types of use and at what magnitude of use these types will occur. Define the relationship of the type and level of use to other zones. Describe the availability of facilities or attraction sites during peak use times. Define the location of use (e.g., concentrated near facilities or dispersed throughout the zone).
- **Resource dependency**: Based on the significance of the zone's resources (identified in the park's mission, goal and objective statements), identify whether some activities may take priority over others if they cannot be accommodated in other zones or within the region.

Social Interaction
- **Level of interaction with other users**: Describe the degree and extent of interaction among groups and between groups - Is the area focused on providing high quality social interaction and affiliation or high quality solitary experiences? Characterize the expectation of visitors in interacting with users of other types. Identify any differences in the magnitude of interaction at attraction sites versus along travel corridors.
- **Level of interaction with park staff:** Describe the amount of interaction with rangers, guided tours (including commercial guides), and staffed information points.

Effort, Risk, Skill and Time Commitment
- **Level of effort, risk, and skill required:** Define the level of outdoor skills needed to experience the area. Note whether activities and interpretation of the landscape are facilitated for visitors, or visitors must depend on self-reliance and knowledge of the landscape to traverse the area safely and with minimal impact to the environment. Define the level of physical exertion that is required. Define the visitors' level of risk and their responsibility for that risk.
- **Time required:** Identify how much time is needed to participate in recreation or education opportunities. Define whether the area accommodates day-use and/or overnight visitation, and which type of use is emphasized when planning facilities and providing recreation opportunities.

Education and Interpretation
- **Level of interpretation and education provided**: Describe the interpretive themes that are emphasized - What are the main messages, and what knowledge gain is expected of the visitor? Characterize the degree of interpretation and education media and programs provided - Are they non-personal services (e.g., exhibits, waysides, TV, brochures) or personal services (e.g., daily ranger led programs, visitor center staffing, lectures and presentations). Define the amount of each type (e.g., education, interpretation, orientation and regulation) of material/program that is provided. Also, note what level of information is provided onsite versus offsite.

Sensory Experience
- **Visitor perceptions:** Define what visitors may feel when they enter and move through the zone. Describe the character of the sensory experience in terms such as wonder, adventure, discovery, isolation, remoteness, social affiliation, competitiveness, etc. Define how the experience is delivered (e.g., structured vs. non structured).
- **Landscape character:** Define the most prominent features of the landscape that have the most sensory impact. Describe the most visually appealing aspects and/or conditions unique to the zone that would facilitate interest in the resource or landscape. In addition, characterize the prominence of facility infrastructure and the development footprint within the zone - How much of the natural landscape is modified for aesthetic or recreational purposes? How noticeable are management activities and facilities to the casual observer?
- **Level of intimacy with resources:** Define how close/involved visitors are to touching, seeing, and feeling natural surroundings and points of interest.

Please answer these questions and provide any other thoughts below.

9. Does the list above fully capture the relevant desired conditions for social settings of the NPS system? If not, please provide any additions that need to be made and provide an explanation.
    (Please insert your response here.)
10. Could anything in this list be omitted? If so, please list the topic to be omitted and provide an explanation.
    (Please insert your response here.)
11. Do the descriptions of the conditions need clarification or revision? If so, what changes would you make?
    (Please insert your response here.)
12. Do the labels supplied adequately reflect the intent of the condition? If not, what changes would you make?
    (Please insert your response here.)

Resource Setting Conditions

Ecological Conditions
- **Habitats critical to ecological processes**: Identify which habitats disproportionately contribute to ecosystem functioning within the landscape or region, and define the general health and size of these natural habitat types. Define the general pattern and connectivity of habitat patches. Also define the amount and type of landscape corridors.
- **Natural disturbance regimes:** Define the condition of natural disturbance events, such as fires, floods, and wind. Consider the type, magnitude, and frequency of disturbances that would occur within the landscape in the absence of human activities, and define the level of facilitation or control over these events in particular areas.
- **Structural complexity**: Define the condition of structural diversity and complexity in both upland and aquatic environments (e.g., magnitude of uneven canopy with gaps, diversity of sediments in streams from silts to cobbles, and abundance of epiphytes and perched soils on tree trunks and large branches).
- **Hydrologic patterns:** Define the general magnitude, frequency, duration, timing, and rate of change (flashiness) of water flow. Describe the level of manipulation of hydrologic patterns that would be permitted, if any, and for what purpose.
- **Nutrient cycling:** Define the general condition of nutrient uptake and cycling and its influence on productivity and composition rates. If necessary, define the degree of reduction or augmentation of nutrient inputs and for what purpose.
- **Purification services:** Define the capability of the area's ecological systems to assimilate and recycle waste materials. Describe potential anthropogenic inputs such as disease-causing organisms, heat, metals, and particulate and dissolved inorganic solids that may compromise purification services. Define the degree and extent of management of these inputs.
- **Biotic interactions:** Identify the species whose effect on their communities is disproportionately large (relative to their abundance), have a high "community importance" and are commonly known as "keystone" species. Identify the population and habitat health of these keystone species. Also, characterize the population health and habitat condition of keystone predators, mutualists, engineers, and other species of importance in the ecosystem of concern.
- **Population dynamics**: Define the condition of dispersion, fertility, recruitment and mortality rates of keystone species and species of special concern.
- **Genetic diversity**: Define the population health of important source and sink populations within a metapopulation. Define the degree and extent of protection efforts for maintaining populations above critical minimum size.
(Adapted from the EPA's "Considering Ecological Processes in Environmental Impact Assessments," July, 1999).

Other Significant Resource Conditions
- **Significant resource conditions**: Define the condition of specific resources that have been determined to be significant as noted in park significance statements, mandates, laws and inventory analyses, and that were not explicitly defined in the description of ecological

conditions. For example, define the quality of the soundscape, lightscape, geologic resources, air quality, etc. Include discussion of all resources of educational, scientific, biological, historic and recreational value.
- **Condition of resources influenced by visitor activities/facilities**: Define the condition of flora and fauna in relation to recreation activities and facilities. Describe how visible signs of impact may be to the casual observer.

Cultural Landscape
- **Cultural resource conditions**: Characterize the appearance and function of cultural resources.   Include the potential treatment as defined by the Secretary of Interior's Standards (e.g., preservation, rehabilitation, reconstruction and restoration). Define the specific prescription for the treatment (e.g., restore to a particular time period). Describe the level of alteration that would be permitted for non-contributing additions and/or adaptive reuse. Define the degree and extent of identification and inventorying for historical/cultural collections.

Please answer these questions and provide any other thoughts below.

13. Does the list above fully capture the relevant desired conditions for resource settings of the NPS system? If not, please provide any additions that need to be made and provide an explanation.
(Please insert your response here.)
14. Could anything in this list be omitted? If so, please list the topic to be omitted and provide an explanation.
(Please insert your response here.)
15. Do the descriptions of the conditions need clarification or revision? If so, what changes would you make?
(Please insert your response here.)
16. Do the labels supplied adequately reflect the intent of the condition? If not, what changes would you make?
(Please insert your response here.)

Management Conditions

Visitor Use Regimentation
- **Visitor Choice:** Define the ability of visitors to participate in spontaneous recreation activities and movement versus more structured and formalized schedules and movement.
- **Visitor Regulation**: Describe the degree and extent that visitors may be managed both indirectly and directly to protect their safety, experiences, and resource conditions. In addition, note locations where visitor use restrictions may primarily occur (e.g., access points, camping areas, or park entrances).

Resource Management Emphasis
- **Management emphasis for resource protection**: Define the degree and extent of management actions that will be permitted and encouraged to protect and rehabilitate significant resources. Identify the focus of management activities for the zone (e.g., custodial management versus allowing natural processes versus restoration of natural processes). How visible will management actions be to the casual observer?

Land Protection
- **Management of other property rights:** Describe the intended management of any private lands, non-NPS roads, water rights, and mineral rights.
- **Interface between park use and traditional uses:** Characterize the relationship between park uses and traditional uses.
- **Relationships with others:** Describe the goals of relations with private and public organizations, adjacent landowners, and government agencies.

Wilderness Area Management
- **Wilderness area management:** Identify the degree and extent of management of wilderness areas and how it relates to park zones. Describe the management of interface areas between wilderness and other parklands, including how visitors will experience the transition.

Research Activities
- **Research activities:** Define the general type of research activities that will be permitted (e.g., manipulative versus nonmanipulative). Identify any restrictions on methods or locations. Define the level of importance of the area for baseline natural resource inventories and long-term ecological observations.

Structures and Facilities
- **Level of visitor amenities:** Describe the primary purpose of infrastructure and the predominant types of facilities that will be provided. Include discussion of all facility types such as orientation/education facilities, recreation facilities, support facilities, and administrative facilities - Do any of these facility types dominate this zone? Describe the character of recreation facilities such as campsites (e.g., primitive with little or no site management or highly developed with well delineated boundaries).

- **Style of facility architecture and type of facility layout:** Describe the character of facilities in terms of design, materials and layout. Note the emphasis that will be placed on blending the facilities with the natural surroundings and the employment of green building techniques.
- **Level of accessibility:** Define the level of access that will be provided to disabled visitors.

Transportation
- **Primary modes of transport:** Define how visitors and staff will primarily be circulating through the zone in terms of types of roadways, trails, and public transportation opportunities. Identify whether the primary means of conveyance is motorized versus non-motorized in different areas and for what purposes (e.g., recreation versus transportation).
- **Type of access routes:** Classify the types of roads and trails that will be provided in terms such as paved, improved, or primitive. Also, note if an area may be predominately trail-less and/or road-less.

Boundary Issues
- **Boundary adjustments:** Define the rationale for any boundary adjustments that may be needed to protect significant resources or opportunities for public enjoyment related to the park purpose. In addition, identify any boundary adjustments that are needed for operational and management issues such as access and boundary identification. Finally, describe any other modifications that are needed to protect park resources that are critical to the park mission (NPS, 1998).

Zone Application
- **Purpose of zone:** Define the primary purpose of the zone in relation to other zones with regards to visitation and resource protection (e.g., primary zone for visitation, portal zone for entry to the backcountry, or ancillary zone for visitation with a primary emphasis on resource protection). Describe how impacts of this zone might be mitigated for other zones (e.g., screening of park service zone to reduce visual and noise impacts).
- **Appropriate location of zone:** Define the potential location of the zone in terms of resource types and/or necessary size.

Please answer these questions and provide any other thoughts below.

17. Does the list above fully capture the relevant desired conditions for management settings of the NPS system? If not, please provide any additions that need to be made and provide an explanation.
    (Please insert your response here.)
18. Could anything in this list be omitted? If so, please list the topic to be omitted and provide an explanation.
    (Please insert your response here.)

19. Do the descriptions of the conditions need clarification or revision? If so, what changes would you make?
(Please insert your response here.)
20. Do the labels supplied adequately reflect the intent of the condition? If not, what changes would you make?
(Please insert your response here.)

SECTION 4

Additional Questions

Please answer these questions and provide any other thoughts below.

21. Explain whether you feel this synthesized material adequately captures, in a general sense, the intent of the discussions on the purpose and criteria for management prescriptions during the May 13-15th workshop?
    (Please insert your response here.)

22. Provide your impressions on the usefulness of these guidelines for future planning efforts.
    (Please insert your response here.)

23. Identify and describe other planning guidelines that should be developed to aid the definition of management prescriptions.
    (Please insert your response here.)

24. Describe how the public has been involved in the development of management prescriptions during planning processes in which you were involved.
    (Please insert your response here.)

25. Describe the ways in which you think the public should be involved in the development of management prescriptions.
    (Please insert your response here.)

*When you are finished with the questionnaire, please save the document with your initials on the end of the existing file name: **Management Prescriptions Survey_Your Initials**. Please attach the document to e-mail and send it to kcahill@vt.edu by July 22, 2002.*

Thank you for your willingness to participate in this survey. My goal is not to oversimplify a very complex issue. Rather, with your help, I hope to provide some general guidelines that might assist future planning efforts with regards to developing management prescriptions.

VITA

Kerri Lynn Cahill graduated from the University of Miami with a Bachelor of Arts in Environmental Policy (second major in English) in 1996, and obtained a Master of Urban and Regional Planning (specializing in natural resource and environmental planning) from Florida State University in 1998. She received her Ph.D. degree in Forestry from Virginia Polytechnic Institute and State University in December 2003.

During her doctoral program at Virginia Polytechnic Institute and State University, she was employed as a Graduate Research Assistant and conducted visitor impact research projects in several National Parks in the United States as well as two protected areas in Chile. Her main research projects included the development of guidance for management prescriptions in National Park Service general management plans. The research involved a qualitative study intended to gain a better understanding of the role and development of management prescriptions for visitor capacity decision-making. In addition, she developed and conducted research to gauge visitor preferences for recreation setting conditions in Acadia National Park.

Her primary research interests include park planning and management, carrying capacity decision-making, visitor experience and management preference evaluation and visitor impact assessment. She is particularly interested in park planning and management in the National Park Service and is currently employed as an outdoor recreation planner with the National Park Service, Denver Service Center.