

The Effect of Use Density and Length of Stay on Visitor Experience in Wilderness

David N. Cole
Troy E. Hall

Abstract—We assessed the degree to which visitor experiences vary between (1) very high use and moderate use places and (2) day users and overnight users. The study was conducted at 10 trailheads in the Alpine Lakes Wilderness, WA, and the Three Sisters Wilderness, OR. Some visitors were asked about trip motivations as they started their trip; others were asked what they experienced after their trip. Questionnaire items were drawn from Recreation Experience Preference (REP) scales, experiences consistent with wilderness, including a number of items regarding the privacy functions of solitude and Attention Restoration Theory (ART). We hypothesized that visitors to very high use trailheads would have lower experience achievement for many of these experiences (for example, solitude and privacy). We also hypothesized that very high use visitors would have a harder time having the experiences they wanted—that the difference between pre-trip motives and post-trip experience achievement would be greater than for moderate use visitors. Our hypotheses were both correct for only seven of the 72 experiences we asked about. All seven of the items experienced less by visitors to very high use places are more descriptors of the setting and conditions that are experienced than of the psychological outcomes that result from what is experienced. None of the experiences that are clearly psychological outcomes were affected by amount of use. More wilderness experiences were influenced by whether one had stayed overnight in the wilderness than by use levels.

Introduction

Wilderness areas are to be managed such that they provide opportunities for high quality visitor experiences, of a type appropriate for wilderness. There is widespread concern that the quality of wilderness experiences is diminished in places where high use levels lead to congested conditions. This raises the question, how do wilderness experiences differ between high-use places in wilderness and places that are less popular? Moreover, day use makes up an increasing proportion of total wilderness visitation. Much of the concern about the “high-use problem” is a concern about day use in these places. Thus there is considerable interest in how the experience of day visitors

differs from that of overnight visitors. Which accounts for more of the variation in experience, use density or length of stay?

The primary objective of the research reported here was to explore certain types of experience that people have on trips in wilderness—the experiences they were seeking, the experiences they attained, and the degree to which they were able to have the experiences they were looking for. In particular, we were interested in the extent to which experiences sought and attained varied between (1) very high and moderate use wilderness and (2) people on day and overnight trips.

The Nature of Wilderness Experiences

For this study, we drew on four different sources to explore the nature of experience. One source of experiential descriptors was the words of the Wilderness Act and concepts common to those writing about wilderness experiences and their values and benefits (Stankey and Schreyer 1987; Shafer and Hammitt 1995; Borrie and Roggenbuck 2001). The language of the Wilderness Act suggests that visitors should experience a setting characterized by: solitude; lack of confinement (sense of freedom); primitiveness (away from modern world); naturalness (including lack of human impact); and remoteness (because wildernesses are large). Moreover, visitors to wilderness should also have the opportunity to experience varied physical responses and cognitive states. In articulating the values and purposes of wilderness, early advocates such as Bob Marshall and Howard Zahniser spoke of such experiences as: challenge; physical revitalization; growth (personal, spiritual); connection to the natural world; absorption (in present moment, timelessness); and serenity (peace, tranquility). Borrie and Roggenbuck (2001) studied the experiences visitors had on a trip to the Okefenokee Wilderness, Georgia. They demonstrated that the experiences visitors had varied over time during their trip. Certainly, some of this variation must be a result of changing settings, but more work is needed on the influence of setting attributes on experience.

Our second source of descriptors was the positive psychological outcomes or benefits that visitors obtain as a result of their wilderness trip. To explore these, we drew on the work of Bev Driver and colleagues on psychometric scales that measure the dimensions of people’s recreation experience. These scales, known as the Recreation Experience Preference (REP) scales, have been used for varied purposes in numerous studies (Manfredo and others 1996). They can be used to assess motivations for or the psychological outcomes desired

Authors: David N. Cole, Aldo Leopold Wilderness Research Institute USDA Forest Service, Missoula, MT; and Troy E. Hall, University of Idaho, Moscow, ID.

In: Cole, David N., comp. 2012. Wilderness visitor experiences: Progress in research and management; 2011 April 4-7; Missoula, MT. Proc. RMRS-P-66. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 219 p.

from a specific trip, as well as the extent to which outcomes were obtained. Motivations are best assessed pre-trip, while experiences attained can only be assessed post-trip. The REP scales are specific to recreational experiences, but not to wilderness. Some of these items are similar to the wilderness-related experiences just described.

Of 19 experience domains, we explored 16 that seemed most relevant to typical wilderness experiences: achievement/stimulation; autonomy/leadership; risk-taking; family togetherness; similar people; new people; learning; enjoy nature; introspection; creativity; nostalgia; physical fitness; physical rest; escape personal-social pressures; escape physical pressure; and risk reduction. The domains we excluded were equipment, social security and teaching-leading others. Studies of wilderness visitors, using REP scales, have been used to describe the relative importance of various motivations for taking wilderness trips (Brown and Haas 1980; Manfredi and others 1983; Driver and others 1987). Less information is available about experience attainment in wilderness and we are not aware of any work on the effects of use density and length of stay on experience attainment.

The third source of descriptors came from an intensive exploration of the concept of solitude, the descriptor most often associated with the wilderness experience and explicit in the Wilderness Act. To psychologists, solitude means being alone, without intrusions, where others cannot observe you (Westin 1967; Marshall 1974; Pedersen 1999), but few wilderness visitors choose to be alone. Hammitt (1982, in press) has argued that this is too strict a definition of the experience opportunity mandated in the Wilderness Act. He suggests that the broader psychological concept of privacy is more aligned with the likely intent of the Act's authors. Privacy refers to the ability to control the amount and type of access one has with others (Altman 1975; Pedersen 1999). If there is a high degree of privacy, wilderness visitors can freely choose how much and what type of interaction with others they want. Freedom of choice and spontaneity of action are often considered important to the wilderness experience (Stankey and Baden 1977). The unit of privacy can be one's self (being alone) or one's group (alone together) (Altman 1975), so solitude (being alone) is just one type of privacy.

There have been several attempts to identify different types of privacy, as well as the different functions of privacy in society. Westin's (1967) initial typologies have been most widely adapted and explored in the wilderness recreation literature (Hammitt 1982; Priest and Bugg 1991; Dawson and Hammitt 1996). However, factor analytic studies have led to modifications of Westin's dimensions by Marshall (1974) and Pedersen (1999). Pedersen (1999) has identified six different types of privacy: intimacy with family (being alone with family); intimacy with friends (being alone with friends); solitude (freedom from observation by others); isolation (being geographically removed from and free from observation by others); anonymity (being seen but not identified or identifiable by others); and reserve (not revealing personal aspects of one's self to others).

In our work on experience, we were most interested in exploring the functions of these varied types of privacy. These

are more enduring psychological outcomes of experiencing different types of privacy during a wilderness visit. Pedersen (1997) has identified five functions of privacy: contemplation (reflecting on one's self); autonomy (freedom of choice and behavior); rejuvenation (recovery and refuge from others and outside world); confiding (intimacy with trusted others); and creativity (develop ideas, work on solutions). Most of these potential outcomes of privacy resonate with the types of benefits articulated by early advocates arguing for wilderness preservation (see, for example, discussions in Graber 1976; Stankey and Schreyer 1987).

The scales Hammitt developed to assess dimensions of wilderness privacy (based on Westin's work) have been field tested in several wilderness settings (Hammitt and Madden 1989; Dawson and Hammitt 1996). Hammitt and Rutlin (1995) also showed that wilderness visitors' ratings of achieved privacy (on a simple 10-point scale) decreased as number of encounters increased and as encounters exceeded individual normative standards for encounters. But the multi-dimensional privacy scales have never been employed to explore how various dimensions of achieved privacy vary with use conditions.

The final conceptual basis for thinking about wilderness experience that we used is the Attention Restoration Theory (ART) developed by Stephen and Rachael Kaplan and colleagues (Kaplan and Kaplan 1989; Kaplan 1995). This theory posits that in their day-to-day lives, people experience mental fatigue as a result of a fatigue of *directed attention*. Directed attention is attention to something that is not particularly interesting but required (such as doing our work, driving in traffic, and so on). Maintaining focus, under these circumstances, requires considerable energy and one's capacity to exert this type of attention is limited. *Involuntary attention*, in contrast, requires little effort because stimuli are inherently interesting and involving (such as listening to music or watching wildlife). ART suggests that restoration of fatigued directed attention can occur by spending time in restorative environments, environments that are conducive to *involuntary attention* and characterized by four properties: being away (being distinctly different, either physically or conceptually, from the everyday environment); fascination (containing patterns that hold one's attention effortlessly); extent (having scope and coherence that captures the mind, fosters exploration and allows one to remain engaged); and compatibility (fitting with and supporting what one wants or is inclined to do) (Kaplan 2001).

Restorative experiences are not exclusive to recreation; nor are they exclusive to wilderness. However, they have much in common with some of the important benefits of recreation and, in particular, of recreation in wilderness. It is not coincidental that one of the Kaplans' long-term research interests has been about experiences in wilderness (Kaplan 1984). In addition, wilderness has often been described as a place to "be away" from the hustle and bustle of everyday existence. Although a number of studies have used rating scales based on ART to assess the restorative qualities of various environments, no such studies have been conducted in wilderness. Previous studies have found that natural environments are more restorative than urban ones (for example, Herzog and others 2003), suggesting

that wilderness might generally possess substantial restorative qualities. The restorative qualities of wilderness have yet to be empirically assessed, although Talbot and Kaplan (1995) interpret observed psychological outcomes of wilderness trips in the terminology of ART. Nor has there been any work on how setting attributes, such as use density, might influence those qualities.

Methods

We administered three different questionnaires. Two focused on trip motivations and were given to visitors at trailheads as they started their trip. One used Recreation Experience Preference (REP) items; the other asked about privacy and various experiences consistent with wilderness. The third questionnaire was given to visitors at trailheads as they exited. It focused on the experiences people attained, using REP scales and items related to privacy, Attention Restoration Theory (ART), and other wilderness-relevant experiences.

The Sample

The survey was conducted at 10 trailheads in the Alpine Lakes Wilderness, WA, and the Three Sisters Wilderness, OR. At Alpine Lakes, we worked at two very high use trailheads (Snow Lake and Pratt Lake), as well as three moderate use trailheads (Cathedral Pass, Gold Creek and Waptus River). At Three Sisters, we also worked at two very high use trailheads (Devils Lake and Green Lakes) and three moderate use trailheads (Sisters Mirror Lake, Elk Lake and Six Lakes). Visitation at the very high use trailheads, which are probably among the 10 most popular trails in Forest Service wilderness in Oregon and Washington, was typically at least 100 people per day. Use on sunny weekend days sometimes exceeded 300 people. This contrasts with typical use levels of 15-20 people per day at moderate use trailheads. At these trailheads, there were summer weekdays when nobody visited. Even on peak weekend days, use levels seldom exceeded 50 people.

Typically, each group of trailheads was sampled twice during the July-August summer season, each time over a 9-day block of time. Researchers were present for at least six hours per day (usually eight hours), with sampling times adjusted to match the times of day that people were likely to be present. Researchers attempted to contact all adult (16 years and older) members of all groups, either as they entered or exited the wilderness and asked them to participate. Nobody was given both an entry and exit survey. Approximately 72% agreed. We obtained 1531 completed questionnaires, 1010 at the very high use trailheads and 521 at the moderate use trailheads. We obtained 380 completed questionnaires from overnight visitors and 1151 from day users.

Data Analysis

We separately analyzed data from the four sources of experiential descriptors: the wilderness-related experience descriptors, the Recreation Experience Preference domains, the privacy

functions and experiences related to Attention Restoration Theory (ART). For each of these other than ART, we used factor analysis of pre-trip motivations (principal components factor analysis with promax rotation) to identify clusters of related individual experience items. Our purpose was more data organization than data reduction. Then we used two-factor analysis of variance to assess the influence of trail use level and length of stay on experience achievement (assessed post-trip). Specifically we hypothesized that visitors to moderate use trails would have higher experience achievement scores than visitors to very high use trails. We also hypothesized in most (but not all) cases that overnight users would have higher experience achievement scores than day use visitors. We present tables for each of the main factors (use level and length of stay), including values for F and p based on two-tailed results. Differences were generally considered significant at $\alpha = 0.10$ if scores were higher for moderate use visitors or overnight visitors. For the few items (such as getting exercise), where it was not logical to hypothesize higher experience achievement for moderate use visitors, differences were considered significant at $\alpha = 0.05$. In the few cases where there was a significant interaction between use level and length of stay, we assessed the effect of each factor at both levels of the other factor.

We also used multiple regression to explore the effect of more precise estimates of amount of use on experience achievement. Independent variables were four different measures related to amount of use, as well as a dummy variable for length of stay. Two measures were objective counts of the number of groups who entered the wilderness and who exited from the wilderness during the period of time (usually 8 hours) that we were handing out questionnaires. Although these measures should provide highly accurate estimates of use density in the area during the sample day, they are not accurate estimates of what visitors encountered. Depending on where and when they came and went, some visitors might see most of the other groups in the area while others might see none. The two other measures were judgments we asked the visitors to make. We asked them how many other groups they encountered and we asked them the percent of time they were in sight of other groups. Such judgments, if accurate, should be more meaningful estimates of use density, from the perspective of influence on the visitor experience. However, such estimates might not be very accurate, because they require remembering the number of other groups encountered and, in the case of the time estimate, the ability to factor in time. Such estimates are likely to vary with attitudes, preferences and expectations. For example, of two individuals encountering the same number of people, a person who felt crowded or expected to see few people is likely to report more encounters than someone who did not feel crowded or who expected to see lots of people.

The two objective counts were highly correlated ($r = 0.84$). The two judgments were less highly correlated ($r = 0.55$). Estimates of the number of groups encountered were more highly correlated than time estimates with trailhead counts. For number of groups entering, correlations were 0.62 for encounter estimates and 0.41 for time estimates. For groups exiting, correlations were 0.65 for encounters and 0.50 for time estimates.

We conducted two-factor analyses of variance using data on pre-trip motivations—the experiences visitors desired—collected as people entered the wilderness (similar to our analyses of post-trip experience achievement). These data are not shown but can be found in Cole and Hall (2008a). We used t-tests to assess the significance of differences between pre-trip motivations and post-trip experience achievement scores. Where post-trip scores are significantly lower than pre-trip scores, we conclude that visitors were unable to have the experiences they desired. Finally, we tested for significant interaction between use level and pre- and post-trip differences (that is, whether the degree to which desired experiences were achieved differed between visitors to very high use and moderate use trails). We also tested interaction between length of stay and pre- and post-trip differences. For this purpose we used analyses of variance with the factors, pre-post trip, use level and length of stay.

Results

All participants were hikers and most came in small groups (Table 1). Day users made up 77% of our sample. Most of the sample had quite a bit of wilderness experience. Wilderness is important to most participants and most participants (70%) reported knowing at least “a little bit about what legally classified Wilderness is”; 24% thought they knew “a lot.” Some of these attributes varied with trail use level and between day and overnight visitors (Table 1). The time spent on day trips was significantly longer ($t = 8.3$, $p < 0.01$) on very high use trails (mean of 4.7 hours) than moderate use trails (mean of 3.8 hours), while the mean number of nights spent on overnight trips was 2.0 regardless of use level. Mean age was greater for day users ($F = 92.3$, $p < 0.01$) and on moderate use trails ($F = 7.5$, $p < 0.01$). Gender did not differ significantly with trail use level ($\chi^2 = 0.1$, $p = 0.75$), but males were significantly more prevalent ($\chi^2 = 16.8$, $p < 0.001$) among overnight users (63%) than day users (52%). Groups were significantly larger on very high use trails, but this was only true for overnight

users ($t = 4.11$, $p < 0.001$). Similarly, overnight groups were significantly larger than day use groups, but only on the very high use trails ($t = 4.95$, $p < 0.001$).

Day users generally had greater levels of wilderness experience. They were less likely to be on their first trip ($\chi^2 = 5.2$, $p = 0.02$) and had been to more other wilderness areas ($\text{gamma} = 0.17$, $p < 0.001$). They visited wilderness more frequently ($\text{gamma} = 0.33$, $p < 0.001$) and had visited the place we contacted them more often ($\text{gamma} = 0.20$, $p < 0.001$). Experience did not vary with trail use level except that visitors to the very high use trails had been to more other wildernesses ($\text{gamma} = -0.11$, $p = 0.01$) than visitors to the moderate use trails. In contrast, overnight users ($\text{gamma} = -0.14$, $p = 0.001$) and visitors to moderate use trails ($\text{gamma} = 0.20$, $p < 0.001$) reported a higher level of knowledge about wilderness. Wilderness attachment scores did not vary significantly with use level or length of stay. With just one exception, these findings about how sample attributes varied with trail use level and length of stay were consistent with what we found in a study of visitors to 36 trailheads with a wide range of use levels in 13 wildernesses distributed across Oregon and Washington (Cole and Hall 2008b). In that study, group size did not vary significantly with use level or length of stay.

Wilderness Related Experiences

A factor analysis of pre-trip motivations, using experiential descriptors from the language of the Wilderness Act and wilderness writers, suggested that the 23 individual items could be clustered into five factors (Table 2). The cluster of items most important to visitors was labeled Wilderness Setting Attributes because the items within this factor are more descriptors of the setting that is experienced than of physical or psychological outcomes of the experience. The factor contains six items that reflect the language of the Wilderness Act (solitude, primitiveness, unconfinedness, naturalness, remoteness and wilderness). The second most important factor was labeled Physical Response because it consists of two items that

Table 1—Variation in visitor attributes with trail use level and length of stay^a.

	High	Moderate	Day	Overnight
Age (mean of those over 16 years)	38 ^c	40 ^d	42 ^c	35 ^d
Male (%)	54	55	52 ^c	63 ^d
Group size (mean number of people)	3.5 ^c	3.0 ^d	3.2 ^c	3.8 ^d
On first wilderness trip (%)	3	2	2 ^c	4 ^d
Other wildernesses visited (median number)	11-15 ^c	6-10 ^d	11-15 ^c	6-10 ^d
Visit wilderness more than 5 times/yr (%)	49	48	54 ^c	33 ^d
Visited “this place” more than 5 times (%)	21	19	23 ^c	12 ^d
Know “a little” or “a lot” about classified wilderness (%)	67 ^c	77 ^d	69 ^c	76 ^d
Wilderness attachment score (mean) ^b	1.46	1.53	1.47	1.52

^a Values with different superscripts within a row are statistically different ($p \leq 0.05$).

^b Mean agreement with 3 items (“I find that a lot of my life is organized around wilderness use,” “I feel like wilderness is a part of me” and “I get greater satisfaction out of visiting wilderness than other areas”, on 7-point scale from strongly agree (+3) to strongly disagree (-3).

Table 2—Use level effects on wilderness-related experiences achieved^a.

Factors and Individual Items	High Use		Mod. Use		ANOVA	
	Mean	S.E.	Mean	S.E.	F	p ^b
Wilderness Setting Attributes						
Being away from the modern world	5.11	0.08	5.54	0.11	5.3	0.02
A sense of freedom	5.21	0.07	5.51	0.12	2.1	0.15
A feeling of remoteness	4.34	0.09	5.28	0.14	13.1	<0.01^c
Surroundings not impacted by people	4.09	0.09	4.89	0.14	13.6	<0.01
Solitude	4.19	0.09	5.32	0.14	12.9	<0.01^c
Wilderness opportunities	4.80	0.10	5.13	0.15	0.1	0.71
Physical Response						
Physical revitalization	4.99	0.08	4.83	0.14	1.6	0.20
Challenge	4.87	0.09	4.53	0.14	10.2	<0.01
Connection to the Natural World						
Fascination with the natural environment	5.56	0.08	5.26	0.13	7.9	<0.01
Connection with or part of wild nature	5.34	0.07	5.40	0.11	0.1	0.74
Being at home in the natural world	5.31	0.07	5.42	0.12	0.5	0.49
The simplicity of life	5.06	0.09	5.20	0.15	0.4	0.54
Free from reliance on modern technology	4.87	0.10	5.25	0.14	0.8	0.37
The dominance of the natural world	4.70	0.09	4.50	0.16	2.9	0.09
Serenity and Absorption						
Peace and tranquility	5.28	0.07	5.73	0.11	3.0	0.09
Living in present rather than past or future	5.20	0.09	5.25	0.15	0.3	0.58
Being totally absorbed in what I am doing	4.66	0.08	4.72	0.14	0.4	0.53
Having solitude interrupted by others	3.61	0.09	2.75	0.13	20.5	<0.01
Feel insignificant part of world around me	3.97	0.11	3.72	0.17	5.3	0.02
Personal Growth						
Awe and humility	4.72	0.10	4.11	0.17	13.6	<0.01
Sense of personal growth	4.16	0.10	4.07	0.16	2.1	0.15
To focus on matters of importance to me	3.56	0.11	3.71	0.17	0.6	0.46
Sense of spiritual growth	3.74	0.10	4.06	0.17	2.0	0.16

^a Means for individual items are responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (very much, most of the time). Items are clustered by pre-trip motivation factor.

^b p based on two-tailed tests. For items such as “peace and tranquility,” where we hypothesized higher scores for visitors to moderate use trails, differences are considered significant when $p \leq 0.10$.

^c Interaction between use level and length of stay is significant for these items. For solitude and remoteness, use level is significant for day users only.

describe a physical response to the wilderness setting—being physically revitalized and experiencing challenge. The three remaining factors consist of psychological outcomes or states of mind resulting from experiencing the wilderness setting. The most important of these to visitors is Connection to the Natural World, six items about being fascinated with, connected to, at home in or feeling the dominance of the natural world, freedom from modern technology and sensing the simplicity of life. A fourth factor, Serenity and Absorption, contains five items: peace and uninterrupted solitude, living in and being absorbed in the present and feeling an insignificant part of the world. The least important factor—still with a mean importance of almost 4.5 on the scale from 1 to 7—is Personal Growth. This factor consists of four items, personal and spiritual growth, awe and an ability to focus on important matters.

The ability to achieve some of these experiences varied with use level (Table 2). Each of the five factors contained items that differed significantly between very high use and moderate use trails; 10 of the 23 individual items differed significantly. Visitors to very high use trails had significantly lower experience

achievement scores for four of the individual items under the Wilderness Setting Attributes factor. Visitors to very high use trails, whether on day or overnight trips, were less able than moderate use trail visitors to experience “a sense of being away from the modern world” and “a sense that the surroundings haven’t been impacted by people.” For the items “a feeling of remoteness” and “solitude,” there was a significant interaction between use level and length of stay. Day users were more able to experience remoteness and solitude on moderate use trails than on very high use trails; but overnight users were equally able to find remoteness and solitude on very high and moderate use trails.

This suggests that visitors to very high use trails had a harder time than visitors to less popular places experiencing the setting attributes that wilderness is supposed to provide. However, differences were not particularly large. The largest difference between means, for the item “solitude,” was 1.13 units (16%) on the 7-point scale. Even on the very high use trails, experience achievement scores for these items were above the scale mid-point of 4.

Surprisingly few of the physical and psychological outcomes were experienced to a greater degree by visitors to moderate use trails. Peace and tranquility, one of the items under the Serenity and Absorption factor, was experienced more on moderate use trails and moderate trail users were less likely to have had their solitude interrupted. However, visitors to very high use trails experienced challenge—one of the items under Physical Response—to a greater degree than visitors to moderate use trails. Visitors to very high use trails experienced more “fascination with the natural environment” (Connection to the Natural World), more feeling of “being an insignificant part of the world around me” (Serenity and Absorption) and more “awe and humility” (Personal Growth).

There were more significant differences between day and overnight visitors than there were between visitors to very high and moderate use trails. Overnight visitors had significantly higher experience achievement scores for items under each of the five factors and 13 of the 23 individual items (Table 3). Day users did not have higher scores for any items.

We explored these relationships in more detail with multiple regression analyses based on the four measures of amount of use we had collected. Use level and length of stay were each

significant variables for 11 of the 23 experiences (Table 4). The negative values for the standardized beta coefficients indicate that overnight users had higher experience achievement scores than day users and that experience achievement declined as use increased. Although this suggests a more pronounced effect of amount of use than was suggested by the analyses of variance, the magnitude of effect was small. The change in R^2 approximates the additional amount of variation in experience achieved resulting from including that variable. The largest variance explained by all use level variables and length of stay combined was 17% for solitude.

The five experiences that were achieved more on moderate use trails (“being away from the modern world,” “a feeling of remoteness,” “a sense that the surroundings haven’t been impacted by people,” “solitude” and “peace and tranquility”) (Table 2), varied significantly with one or more of the four measures of amount of use (Table 4).

On average, then, experience achievement tends to decline as use increases, but there is substantial variation among people. For example, eight of the 53 individuals who reported seeing other groups more than 50% of the time assigned a score of 6 or 7 to the item “solitude” (on the 7-point scale with 7 being

Table 3—Length of stay effects on wilderness-related experiences achieved^a.

Factors and Individual Items	Day Use		Overn. Use		ANOVA	
	Mean	S.E.	Mean	S.E.	F	p ^b
Wilderness Setting Attributes						
Being away from the modern world	5.17	0.08	5.47	0.14	1.4	0.23
A sense of freedom	5.27	0.07	5.39	0.13	0.1	0.81
A feeling of remoteness	4.46	0.09	5.20	0.15	6.3	0.01
Surroundings not impacted by people	4.25	0.09	4.56	0.17	0.3	0.56
Solitude	4.33	0.09	5.24	0.15	7.9	<0.01
Wilderness opportunities	4.81	0.09	5.21	0.17	1.6	0.20
Physical Response						
Physical revitalization	4.93	0.08	4.99	0.16	0.2	0.67
Challenge	4.58	0.09	5.50	0.14	26.8	<0.01
Connection to the Natural World						
Fascination with the natural environment	5.40	0.08	5.73	0.15	4.3	0.04
Connection with or part of wild nature	5.31	0.07	5.57	0.13	2.4	0.13
Being at home in the natural world	5.30	0.07	5.54	0.13	2.1	0.14
The simplicity of life	5.01	0.09	5.46	0.15	5.2	0.02
Free from reliance on modern technology	4.84	0.09	5.56	0.15	9.6	<0.01
The dominance of the natural world	4.50	0.09	5.20	0.17	13.7	<0.01
Serenity and Absorption						
Peace and tranquility	5.35	0.07	5.69	0.12	1.9	0.17
Living in present rather than past or future	5.16	0.09	5.42	0.17	1.2	0.28
Being totally absorbed in what I am doing	4.59	0.08	5.02	0.16	4.4	0.04
Having solitude interrupted by others	3.30	0.08	3.53	0.17	5.4	0.02
Feel insignificant part of world around me	3.71	0.10	4.65	0.21	17.5	<0.01
Personal Growth						
Awe and humility	4.41	0.09	5.09	0.19	13.8	<0.01
Sense of personal growth	4.02	0.09	4.58	0.18	6.7	0.01
To focus on matters of importance to me	3.47	0.10	4.14	0.21	5.9	0.02
Sense of spiritual growth	3.76	0.10	4.12	0.20	2.0	0.16

^a Means for individual items are responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (very much, most of the time).

^b p based on two-tailed tests.

Table 4—Multiple regression results^a relating four estimates of amount of use and length of stay^b to the extent wilderness-related experiences were achieved^c.

Factors and Individual Items	Entering Groups		Exiting Groups		Groups Seen		Time Seen		Day/Overnight	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Wilderness Setting Attributes										
Being away from the modern world	-	-	.01	-.12	-	-	.04	-.13	-	-
A sense of freedom	-	-	-	-	-	-	.03	-.18	-	-
A feeling of remoteness	.02	-.14	-	-	-	-	.06	-.19	.02	-.13
Surroundings not impacted by people	.01	-.13	-	-	-	-	.04	-.14	-	-
Solitude	.02	-.15	-	-	-	-	.11	-.27	.04	-.19
Wilderness opportunities	-	-	.02	-.15	-	-	-	-	-	-
Physical Response										
Physical revitalization	-	-	-	-	-	-	-	-	-	-
Challenge	-	-	-	-	-	-	-	-	.05	-.22
Connection to the Natural World										
Fascination with the natural environment	-	-	-	-	-	-	-	-	-	-
Connection with or part of wild nature	-	-	-	-	-	-	.01	-.11	-	-
Being at home in the natural world	-	-	-	-	-	-	-	-	-	-
The simplicity of life	-	-	-	-	.01	-.10	-	-	-	-
Free from reliance on modern technology	-	-	-	-	-	-	-	-	.03	-.16
The dominance of the natural world	-	-	-	-	-	-	-	-	.02	-.15
Serenity and Absorption										
Peace and tranquility	-	-	-	-	.05	-.14	.01	-.13	-	-
Living in present rather than past or future	-	-	-	-	-	-	-	-	-	-
Being totally absorbed in what I am doing	-	-	-	-	-	-	-	-	.01	-.10
Having solitude interrupted by others	.03	.20	-	-	-	-	.09	.22	.01	-.09
Feel insignificant part of world around me	-	-	-	-	-	-	-	-	.03	-.18
Personal Growth										
Awe and humility	-	-	-	-	-	-	-	-	.02	-.15
Sense of personal growth	-	-	-	-	-	-	-	-	.01	-.12
To focus on matters of importance to me	-	-	-	-	-	-	-	-	.02	-.14
Sense of spiritual growth	-	-	-	-	.01	-.10	-	-	-	-

^a Values are (1) the change in R^2 (variance explained) that results from adding significant variables to the stepwise model and (2) standardized beta coefficients of the full model (illustrating directionality and magnitude of effect). Negative beta indicates experience achievement declines as use increases or is higher for overnight than day users.

^b Independent variables are (1) number of groups entering during the day, (2) number of groups exiting during the day, (3) visitor estimates of number of groups seen, (4) visitor estimates of percent time in sight of other groups and (5) a dummy variable for day vs. overnight use.

^c Responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (extremely).

an extreme level of achievement). Conversely, four of the 69 individuals who reported seeing other groups less than 1% of the time assigned a score of 1 or 2 to the item, suggesting little ability to get away from crowds even though they only saw a few others.

In addition to being highly variable, the relationship between use and experience was weak—that is, large differences in amount of use resulted in quite small differences in experience. To illustrate this graphically, we divided each measure of amount of use into ten categories, each with roughly equivalent numbers of observations (about 50 individuals in each category). For each use category (for example, 14 to 16 groups entering, 6-10% of time in sight of others), we calculated means and standard deviations. These were plotted on graphs, using the midpoint of each use category, and fitted with straight lines. In effect this separated the variability associated with differences between respondents (illustrated by the standard deviations) from the effect of use on experience (how well the mean values can be fitted to a model—in our case a straight line).

Figures 1a-d show how the ability to have “solitude” varied with each of the four use measures. This is one of the two experiences most influenced by amount of use. For each measure, the high degree of variability is evident. However, there is clearly a tendency for solitude to be more difficult to experience as use levels increase. This suggests that low r^2 values reflect variability among people in the amount of solitude they experience given a particular use density rather than the lack of a linear relationship between use and solitude for each respondent. This is consistent with the findings of Stewart and Cole (2001) at Grand Canyon National Park, where they were able to study how the same person responded to different use densities.

Figure 2 shows how the relationship between amount of use and solitude achievement varies between day and overnight users. Day users experience less solitude than overnight users at all but the lowest use densities. Moreover, solitude declines more with increasing number of encounters among day users. Consequently, differences between day and overnight users are greater at the higher use levels. This difference may reflect

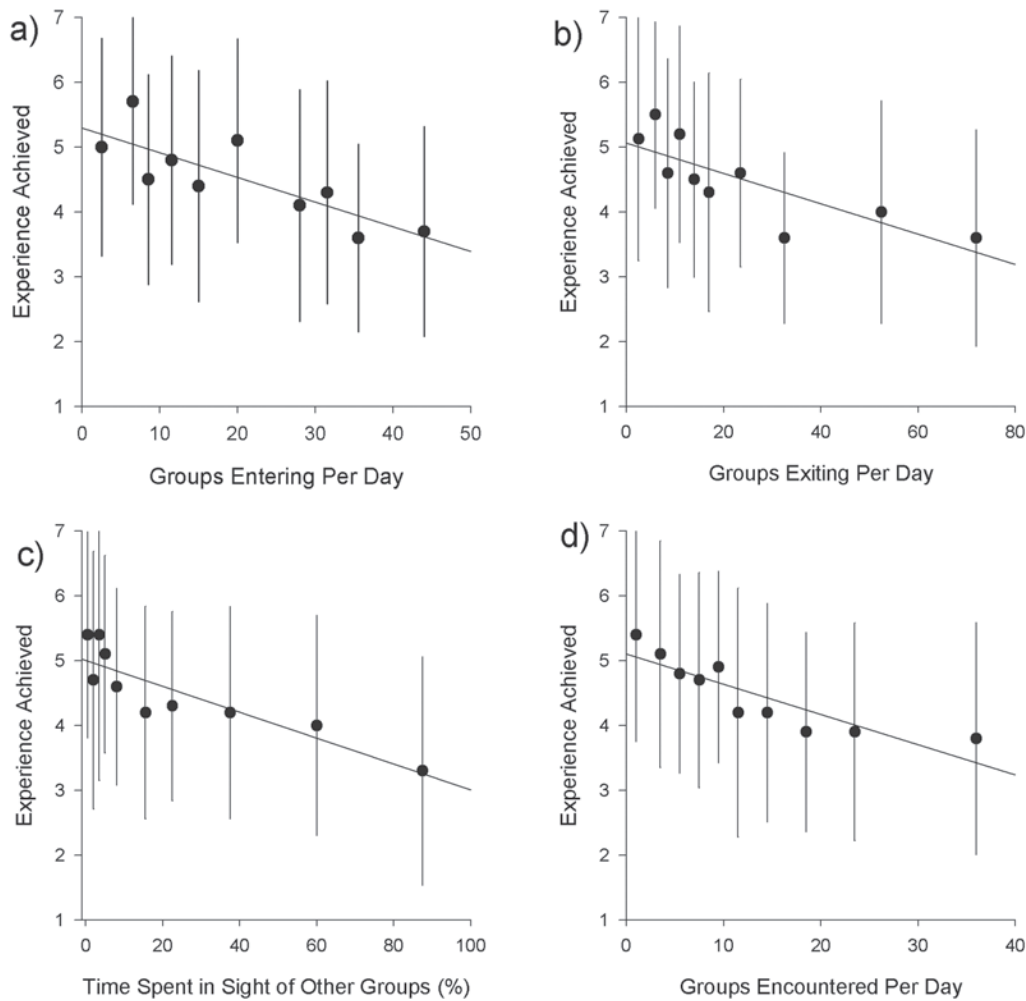


Figure 1—Relationship between four different measures of amount of use and the extent to which solitude was achieved on a scale from 1 (not at all) to 7 (very much). Values are mean responses and standard deviations within each of 10 use level classes.

the ability of overnight users in popular places to have solitude at their camp, despite encountering many other groups during the day.

The six experiences, in addition to solitude, that were achieved to a significantly higher degree on moderate use trails (Table 2) are shown in Figure 3, using the measure of use density with the most explanatory power. Clearly, increasing use has adverse effects on experience achievement but the magnitude of effect is small. Even at the highest levels of use, mean experience achievement scores are above the scale midpoint, except in the case of surroundings that have not been impacted and remoteness.

For the experiences that vary most with amount of use, the subjective judgments of amount of use explain more variation than the objective counts. This may mean that the judgments are better approximations of what was actually experienced or it may reflect biased estimation in which those feeling less solitude or more crowding report higher encounter levels than those not feeling that way.

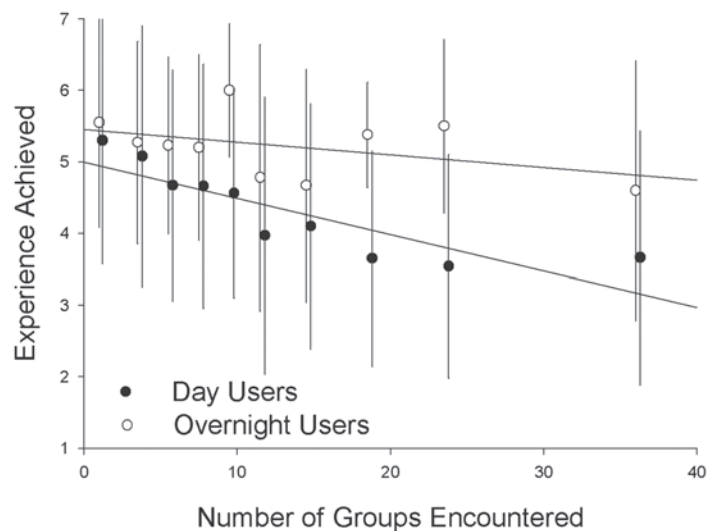


Figure 2—Difference between day and overnight visitors in the relationship between group encounters and the extent to which solitude was achieved on a scale from 1 (not at all) to 7 (very much). Values are mean responses and standard deviations within each of 10 use level classes.

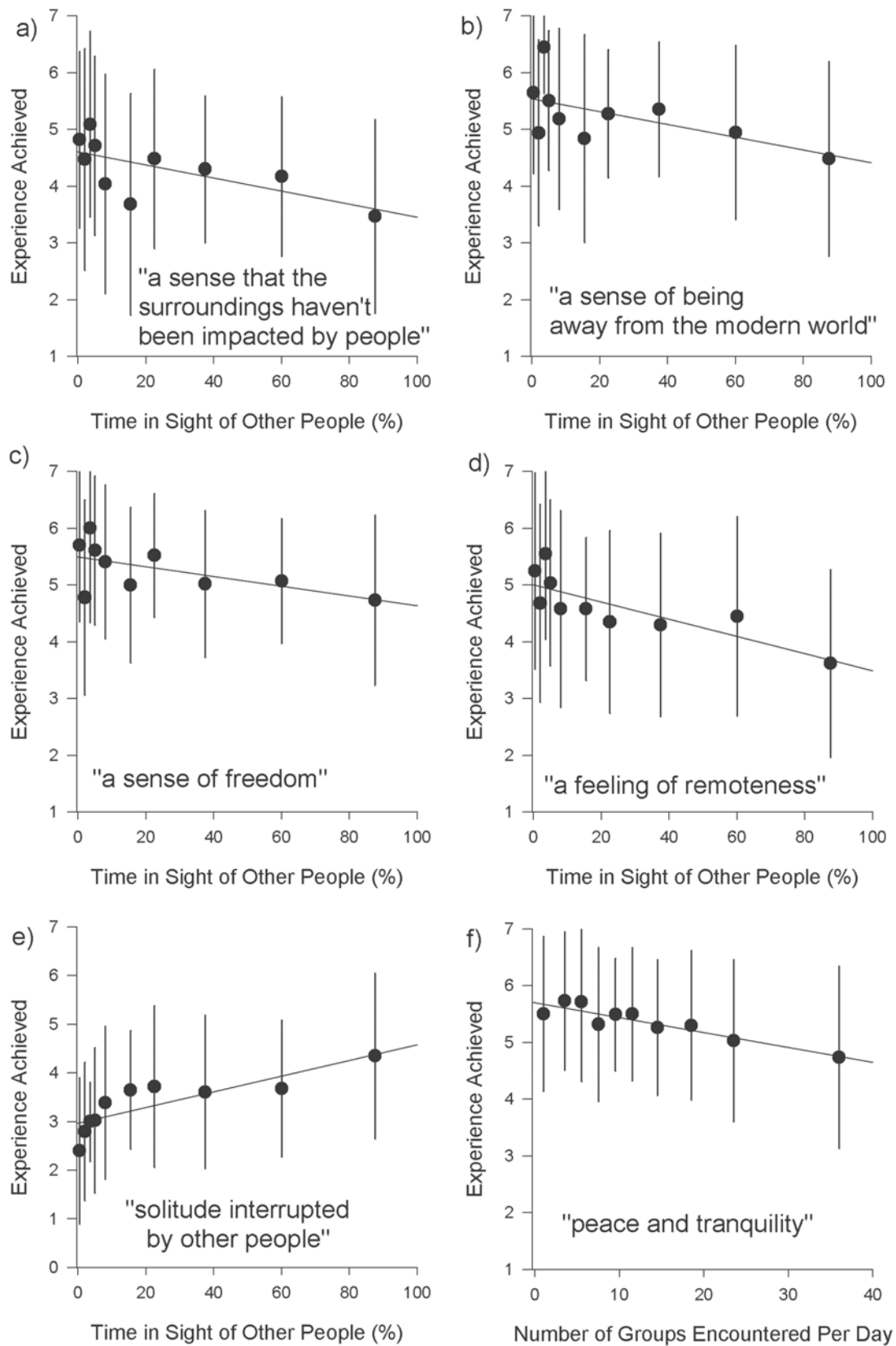


Figure 3—Relationship between the time other groups were in sight (%) and the experiences (in addition to solitude) that were most influenced by amount of use on a scale from 1 (not at all) to 7 (very much). Values are mean responses and standard deviations within each of 10 use level classes.

Satisfaction with one's experience is a function of motivations and expectations (Manning 1999). Therefore, in addition to interest in the ability to achieve certain experiences, we were also interested in the relationship between desired experiences (motivations) and achieved experiences. A low level of experience achievement is less problematic if there is little desire for that experience. We examined differences between mean pre-trip and post-trip scores and tested for interaction between these differences and use level, as well as length of stay. A significant interaction suggests that the relationship between motivations and experiences differs with use level or length of stay. For example, visitors on moderate use trails both desired and achieved more solitude than visitors on very high use trails. Since the difference between use levels was greater for what was experienced than for what was desired, the interaction between pre-post trip differences and use level was significant, suggesting that very high use trail visitors were less able to have the solitude experience they wanted. This contrasts with similar data for "a sense of being away from the modern world." Again, visitors on moderate use trails both desired and achieved more sense of being away. In this case, however, the interaction is not significant. Moderate use visitors were no more able than very high use visitors to achieve

the level of feeling away that they desired. For solitude, very high use visitors both experienced less solitude and were less able to experience what they desire. For feeling away from the modern world, very high use visitors experienced less of a sense of being away but were no less able to experience what they desire.

For nine of the 22 experiences, pre-trip motivations differed significantly from experiences achieved (Table 5). The item about interrupted solitude is not included because the fact that it was asked differently makes pre-post differences difficult to interpret. Eight experiences were achieved less than they were desired. These included items from each factor other than Serenity and Absorption. One experience was achieved more than it was desired--feeling "free from reliance on modern technology."

For three of the six items under the Wilderness Setting Attribute factor and the individual experiences "not having my solitude interrupted by other people," "feel an insignificant part of the world," and "feel awe and humility," there was a significant interaction between pre-post trip differences and use level (Table 8). For the Wilderness Setting Attribute items and for "not having my solitude interrupted," very high use visitors were less able to experience what they desire than moderate

Table 5—Difference in wilderness-related experiences between pre-trip and post-trip evaluations; interaction between this difference and use level and length of stay^a.

Factors and Individual Items	Pre-Trip	Post-Trip	Use Interaction		Length Interaction	
			F	p	F	p
Wilderness Setting Attributes						
Sense being away from the modern world	5.62	5.24	0.1	0.71	0.7	0.40
A sense of freedom	5.51	5.29	0.0	0.88	0.0	0.95
A feeling of remoteness	5.36 ^c	4.58 ^d	2.7	0.10	1.9	0.17
Sense surroundings not impacted by people	5.34 ^c	4.34 ^d	3.5	0.06	0.5	0.49
Solitude	5.26 ^c	4.52 ^d	5.2	0.02	5.1	0.02
Wilderness opportunities	5.11	4.87	0.2	0.64	1.0	0.32
Physical Response						
To be physically revitalized	5.64 ^c	4.94 ^d	1.4	0.24	0.1	0.82
To be challenged	4.86	4.76	0.5	0.49	7.4	<0.01
Connection to the Natural World						
Be fascinated with the natural environment	5.64	5.46	2.3	0.13	2.0	0.16
Feel connected with or part of wild nature	5.56 ^c	5.32 ^d	1.7	0.19	0.3	0.58
To feel at home in the natural world	5.41	5.32	0.2	0.64	0.8	0.36
To sense the simplicity of life	5.28	5.09	1.1	0.29	3.7	0.05
Free from reliance on modern technology	4.70 ^c	4.96 ^d	0.0	0.92	7.8	<0.01
Sense the dominance of the natural world	4.54	4.62	2.3	0.13	6.6	0.01
Serenity and Absorption						
To feel peace and tranquility	5.59	5.40	0.5	0.50	0.7	0.39
Living in present rather than past or future	5.26	5.24	1.8	0.18	0.3	0.60
To be totally absorbed in what I am doing	5.00	4.68	0.7	0.40	3.0	0.08
Feel solitude not interrupted by others ^b	4.83 ^c	3.31 ^d	54.8	<0.01	1.7	0.20
Feel an insignificant part of world	4.13	3.91	7.3	<0.01	9.2	<0.01
Personal Growth						
To feel awe and humility	4.87 ^c	4.52 ^d	7.0	<0.01	4.3	0.04
To feel a sense of personal growth	4.45 ^c	4.09 ^d	0.8	0.36	0.4	0.55
To focus on matters of importance to me	4.43 ^c	3.61 ^d	0.6	0.42	2.4	0.12
To feel a sense of spiritual growth	4.13	3.81	0.1	0.74	0.3	0.56

^a Pre- and post-trip values are means for responses to questions about how much visitors desired or experienced each item, on a scale from 1 (not at all) to 7 (extremely). Items with different superscripts are significantly different ($p \leq 0.05$). We hypothesized greater ability to have desired experiences for overnight visitors and visitors to moderate use trails, so differences are considered significant when $p \leq 0.10$.

^b Before the trip, we asked about the desire to not have solitude interrupted; after the trip we asked about experiencing interruptions of solitude. For this item, the larger the difference between pre-and post-trip, the less solitude was interrupted.

use visitors. For the experiences “feel an insignificant part of the world” and “feel awe and humility”, very high use visitors were more able to experience what they desire than moderate use visitors.

There were also eight experiences for which there was a significant interaction between pre-post trip differences and length of stay. In all cases, the difference between desires and experience achieved was greater for day users than overnight users. For “solitude,” neither type of visitor had their desires met, but day users were less able to experience what they desire. For “to be challenged,” “sense the simplicity of life,” “sense the dominance of the natural world,” “to be totally absorbed in what I am doing,” “feel an insignificant part of the world” and “feel awe and humility,” overnight visitors achieved more than they desired while day visitors were not able to meet their desires. For feeling “free from reliance on modern technology,” experience achieved exceeded experience desired for both groups, but pre-post trip differences were smaller for day users.

Recreation Experience Preferences

We explored the psychological outcomes and benefits of wilderness experiences further by drawing on three different theoretical frameworks. One of these was the Recreation Experience Preference (REP) scales developed by Driver and others (1987). A number of the items in these scales (such as, having a sense of solitude) are similar to those described in the previous section. We explore them separately here because these scales were developed through a process not exclusive to examining wilderness experiences.

A factor analysis of pre-trip motivations suggested that the 27 individual items can be clustered within six factors (Table 6). The factor most important to visitors, **Enjoy Nature and Learning**, contained items from two of Driver’s experience domains: Enjoy Nature and Learning. **Solitude and Autonomy** contained items from two of Driver’s domains: Escape Physical Pressure and Autonomy. The third factor, **Family and Friends**, contained two items

Table 6—Use level effects on experiences achieved^a, using Recreation Experience Preference scale items.

Factors and Individual Items	High Use		Mod. Use		ANOVA	
	Mean	S.E.	Mean	S.E.	F	p ^b
Enjoy Nature and Learning						
View the scenery	6.33	0.05	6.27	0.08	0.1	0.72
Be close to nature	5.77	0.07	5.93	0.06	0.1	0.70
Explore the area	5.28	0.09	5.71	0.11	0.2	0.64
Gain a better appreciation of nature	5.33	0.08	5.33	0.14	0.9	0.35
Learn about this place	4.33	0.10	4.57	0.15	1.1	0.30
Solitude and Autonomy						
Be where it’s quiet	5.36	0.08	5.97	0.11	6.7	0.01
Get away from crowded situations awhile	4.44	0.10	5.79	0.12	32.2	<0.01
Experience the open space	5.79	0.07	5.92	0.10	0.0	0.99
Have a sense of solitude	4.20	0.09	5.40	0.14	17.1	<0.01^c
Be my own boss	3.46	0.11	3.31	0.17	2.9	0.09
Feel isolated	3.68	0.09	4.42	0.17	6.0	0.01
Family and Friends						
Do something with my companions	5.36	0.11	5.78	0.14	3.1	0.06
Do something with my family	3.72	0.13	4.46	0.21	6.4	0.02
Introspection, Relaxation and Personal Growth						
Give my mind a rest	4.92	0.09	5.28	0.13	1.0	0.31
Get away from the usual demands of life	5.03	0.10	5.28	0.14	1.4	0.25
Relax physically	4.84	0.10	4.78	0.16	0.0	0.99
Grow and develop spiritually	3.62	0.11	3.83	0.18	0.1	0.72
Think about who I am	3.39	0.10	3.44	0.17	0.5	0.47
Gain a new perspective on life	3.66	0.10	3.70	0.17	0.4	0.55
Reflect on past memories	4.13	0.10	3.96	0.16	3.9	0.05
Achievement and Physical Fitness						
Get exercise	6.26	0.06	6.04	0.10	4.1	0.04
Gain a sense of accomplishment	5.15	0.09	4.72	0.15	9.8	<0.01
Show myself I could do it	4.24	0.11	3.79	0.17	8.8	<0.01
Develop my skills and abilities	3.75	0.10	3.54	0.16	3.9	0.05
People and Risk						
Experience risky situations	3.10	0.10	2.76	0.14	14.6	<0.01^c
Feel other people could help if I need them	3.20	0.11	2.85	0.16	0.9	0.35
Be with and observe others using the area	2.86	0.10	2.28	0.13	13.1	<0.01

^a Means for individual items are responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (extremely).

^b p based on two-tailed tests.

^c Interaction between use and length of stay is significant for these items. For solitude, use level is significant for overnight users only; for risk, use level is significant only for day users.

from the domains Family Togetherness and Similar People. A fourth factor, **Introspection, Relaxation and Personal Growth**, contained seven items from the domains Driver called Introspection, Escape Personal-Social Pressures, Nostalgia, Physical Rest and Creativity. A fifth factor, **Achievement and Physical Fitness**, contained four items from the domains Driver called Achievement and Physical Fitness. The final factor, **People and Risk**, contains three items Driver called Risk-Taking, Risk-Reduction and New People.

The ability to achieve some of these experiences varied with use level (Table 6). Visitors to very high use trails had significantly lower experience achievement scores for four individual items related to Solitude and for the item “do something with my family.” For the item “have a sense of solitude”, there was a significant interaction between use level and length of stay. Overnight users were more able to find solitude on moderate use trails than on very high use trails; but day users were equally able to find solitude on very high and moderate use trails.

Visitors to very high use trails had significantly higher experience achievement scores for all four items in the factor Achievement and Fitness, as well as the individual items “reflect on past memories,” “experience risky situations,” and “be with and observe others using the area” (Table 6). For the item “experience risky situations,” there was a significant interaction between use level and length of stay. Day users on very high use trails felt more risk than day users on moderate use trails; but overnight users’ sense of risk did not vary with amount of use.

None of the items related to Enjoy Nature and Learning—the most important motivation—varied significantly with use level. Neither did most of the items related to Introspection, Relaxation and Personal Growth.

More items differed significantly between day and overnight visitors. Overnight visitors had significantly higher experience achievement scores for items in five of the six factors: Enjoy Nature and Learning, Solitude and Autonomy, Introspection and Personal Growth, Achievement and Physical Fitness and New People and Risk (Table 7). Overnight visitors had significantly

Table 7—Length of stay effects on experiences achieved^a, using Recreation Experience Preference scale items.

Factors and Individual Items	Day Use		Overn. Use		ANOVA	
	Mean	S.E.	Mean	S.E.	F	p ^b
Enjoy Nature and Learning						
View the scenery	6.31	0.05	6.34	0.10	0.6	0.43
Be close to nature	5.78	0.07	5.93	0.13	0.4	0.56
Explore the area	5.28	0.08	5.89	0.11	5.9	0.02^c
Gain a better appreciation of nature	5.30	0.08	5.48	0.16	0.6	0.44
Learn about this place	4.22	0.10	5.10	0.18	11.0	<0.01^c
Solitude and Autonomy						
Be where it's quiet	5.42	0.08	5.99	0.12	5.7	0.02
Get away from crowded situations awhile	4.68	0.09	5.40	0.16	3.4	0.07
Experience the open space	5.79	0.07	5.99	0.11	1.0	0.32
Have a sense of solitude	4.38	0.09	5.28	0.15	8.1	<0.01^c
Be my own boss	3.26	0.10	4.03	0.21	10.8	<0.01
Feel isolated	3.65	0.09	4.88	0.17	25.1	<0.01
Family and Friends						
Do something with my companions	5.43	0.10	5.71	0.19	0.8	0.36
Do something with my family	3.95	0.13	3.89	0.27	0.7	0.42
Introspection, Relaxation and Personal Growth						
Give my mind a rest	4.95	0.08	5.29	0.17	1.1	0.29
Get away from the usual demands of life	5.01	0.10	5.67	0.16	7.5	<0.01
Relax physically	4.94	0.09	4.37	0.20	7.2	<0.01
Grow and develop spiritually	3.55	0.10	4.18	0.21	5.9	0.02
Think about who I am	3.33	0.09	3.70	0.21	2.1	0.15
Gain a new perspective on life	3.59	0.09	3.99	0.20	2.7	0.10
Reflect on past memories	3.96	0.10	4.55	0.18	6.7	0.01
Achievement and Physical Fitness						
Get exercise	6.24	0.05	6.01	0.12	2.6	0.11
Gain a sense of accomplishment	4.91	0.09	5.52	0.15	11.9	<0.01
Show myself I could do it	3.95	0.10	4.77	0.20	13.8	<0.01
Develop my skills and abilities	3.53	0.09	4.36	0.19	16.7	<0.01
People and Risk						
Experience risky situations	2.79	0.09	3.89	0.19	30.7	<0.01
Feel other people could help if I need them	3.05	0.10	3.32	0.20	3.5	0.09
Be with and observe others using the area	2.60	0.09	3.07	0.20	8.1	<0.01

^a Means for individual items are responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (extremely). Items are clustered by pre-trip motivation factor.

^b p based on two-tailed tests. For items such as “get away from crowded situations for awhile” where we hypothesized higher scores for overnight users, differences are considered significant when $p \leq 0.10$.

^c Interaction between use and length of stay is significant for these items. For each, length of stay is significant on high use trails only.

higher scores for 16 of the 27 individual items. Day users had significantly higher scores for only one item—"being able to relax physically". The only factor that did not vary significantly with length of stay was Family and Friends.

Multiple regression analyses, using the four measures of amount of use we had collected and a dummy variable for length of stay, also suggest that whether one is on a day trip or an overnight trip affects more of these experiences than amount of use (Table 8). Length of stay was a significant variable for 17 of the 27 experiences, while amount of use was significant for 13 of the experiences. The magnitude of effect was small, however. The largest variance explained by length of stay was 6% for "experience risky situations." For most experiences, variance explained was just 1-2%. The negative values for most standardized beta coefficients indicate that overnight users had higher experience achievement scores than day users. Day users had higher achievement for "relax physically" and "get exercise."

The five experiences that were achieved more on moderate use trails ("be where it's quiet," "get away from crowded situations for awhile," "have a sense of solitude," "feel isolated" and "do something with my family"), varied significantly with one or more of the four measures of amount of use (Table 8). However, amount of use did not explain much of the variation in experience achieved for any of these experiences and the relationship between use and experience was weak; large differences in amount of use resulted in quite small differences in experience.

For 14 of the 27 experiences, pre-trip motivations differed significantly from experiences achieved (Table 9). Nine experiences were achieved less than they were desired. These included particularly items in the Solitude and Autonomy and the Introspection, Relaxation and Personal Growth factors. Five experiences were achieved more than they were desired. These were mostly items related to Achievement and Physical Fitness.

Table 8—Multiple regression results^a relating four estimates of amount of use and length of stay^b to experiences achieved^c.

Factors and Individual Items	Entering Groups		Exiting Groups		Groups Seen		Time Seen		Day/Overnight	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Enjoy Nature and Learning										
View the scenery	-	-	-	-	-	-	-	-	-	-
Be close to nature	-	-	.02	-.14	-	-	-	-	-	-
Explore the area	-	-	.03	-.16	-	-	-	-	.02	-.14
Gain a better appreciation of nature	-	-	-	-	-	-	-	-	-	-
Learn about this place	-	-	.03	-.15	-	-	-	-	.02	-.14
Solitude and Autonomy										
Be where it's quiet	-	-	-	-	.02	-.15	.07	-.18	.02	-.13
Get away from crowded situations awhile	.01	-.13	-	-	.20	-.24	.04	-.22	.02	-.11
Experience the open space	-	-	-	-	.02	-.13	-	-	-	-
Have a sense of solitude	.02	-.15	-	-	-	-	.11	-.27	.04	-.19
Be my own boss	-	-	-	-	-	-	-	-	.02	-.16
Feel isolated	-	-	.03	-.15	-	-	-	-	.02	-.14
Family and Friends										
Do something with my companions	.01	-.10	-	-	-	-	-	-	-	-
Do something with my family	-	-	.01	-.09	-	-	-	-	-	-
Introspection, Relaxation and Personal Growth										
Give my mind a rest	-	-	-	-	-	-	-	-	-	-
Get away from the usual demands of life	-	-	-	-	.01	-.12	-	-	.02	-.12
Relax physically	-	-	-	-	.01	-.12	-	-	.01	-.13
Grow and develop spiritually	-	-	-	-	-	-	-	-	.01	-.10
Think about who I am	-	-	-	-	-	-	-	-	-	-
Gain a new perspective on life	-	-	-	-	-	-	-	-	-	-
Reflect on past memories	-	-	-	-	-	-	-	-	.02	-.12
Achievement and Physical Fitness										
Get exercise	-	-	-	-	-	-	-	-	.01	.09
Gain a sense of accomplishment	-	-	-	-	-	-	-	-	.02	-.13
Show myself I could do it	-	-	-	-	-	-	-	-	.03	-.17
Develop my skills and abilities	-	-	-	-	-	-	-	-	.03	-.18
People and Risk										
Experience risky situations	-	-	-	-	-	-	-	-	.06	-.24
Feel other people could help if I need them	-	-	-	-	-	-	-	-	-	-
Be with and observe others using the area	-	-	-	-	.01	.12	-	-	.01	-.13

^a Values are (1) the change in R^2 (variance explained) that results from adding significant variables to the stepwise model and (2) standardized beta coefficients of the full model (illustrating directionality and magnitude of effect). Negative beta indicates that experience achievement declines as use increases and is higher for overnight users than day users.

^b Independent variables are (1) number of groups entering during the day, (2) number of groups exiting during the day, (3) visitor estimates of number of groups seen, (4) visitor estimates of percent time in sight of other groups and (5) a dummy variable for day vs. overnight use.

^c Responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (extremely).

Table 9—Difference between pre-trip and post-trip experience evaluations, using Recreation Experience Preference scale items, and interaction between this difference and use level and length of stay^a.

Factors and Individual Items	Pre-Trip	Post-Trip	Use Interaction		Length Interaction	
			F	p	F	p
Enjoy Nature and Learning						
View the scenery	6.27	6.28	0.1	0.74	0.1	0.76
Be close to nature	6.17^c	5.78^d	0.1	0.95	0.1	0.70
Explore the area	5.87^c	5.32^d	0.5	0.48	1.3	0.26
Gain a better appreciation of nature	5.19	5.22	0.7	0.40	2.2	0.14
Learn about this place	4.69	4.37	0.3	0.56	2.0	0.16
Solitude and Autonomy						
Be where it's quiet	5.70	5.48	2.9	0.09	0.6	0.46
Get away from crowded situations awhile	5.57^c	4.79^d	23.3	<0.01	0.3	0.60
Experience the open space	5.50^c	5.78^d	1.6	0.20	0.9	0.34
Have a sense of solitude	5.06^c	4.52^d	6.2	0.01	1.1	0.29
Be my own boss/free to make own choices	3.56	3.18	7.8	<0.01	7.0	<0.01
Feel isolated	4.03	3.83	0.0	0.87	3.9	0.05
Family and Friends						
Do something with my companions	5.54	5.49	1.5	0.23	0.2	0.68
Do something with my family	4.55^c	3.94^d	0.0	0.93	0.1	0.72
Introspection, Relaxation and Personal Growth						
Give my mind a rest	5.69^c	5.03^d	0.5	0.48	0.2	0.63
Get away from the usual demands of life	5.08	5.10	0.1	0.79	0.1	0.80
Relax physically	5.05^c	4.81^d	0.0	0.84	2.1	0.15
Grow and develop spiritually	4.35^c	3.69^d	0.2	0.68	0.0	0.87
Think about who I am	4.12^c	3.41^d	0.2	0.64	0.2	0.68
Gain a new perspective on life	3.93	3.65	0.3	0.61	0.0	0.88
Reflect on past memories	3.81^c	4.09^d	1.0	0.32	2.2	0.14
Achievement and Physical Fitness						
Get exercise	5.76^c	6.19^d	0.4	0.53	3.8	0.05
Gain a sense of accomplishment	4.84^c	5.04^d	2.5	0.11	3.1	0.08
Show myself I could do it	3.92^c	4.11^d	1.1	0.30	2.0	0.16
Develop my skills and abilities	3.61	3.71	1.6	0.21	1.0	0.32
People and Risk						
Experience risky situations	3.22	3.00	4.3	0.04	5.1	0.02
Feel other people could help if I need them	3.05	3.11	1.4	0.23	0.2	0.65
Be with and observe others using the area	2.81	2.68	3.2	0.07	2.7	0.10

^a Pre- and post-trip values are means for responses to questions about how much visitors desired or experienced each item, on a scale from 1 (not at all) to 7 (extremely). Items with different superscripts are significantly different ($p \leq 0.05$). For items such as "be where it's quiet," where we hypothesized higher ability to experience what was desired for moderate trail users, differences are considered significant when $p \leq 0.10$.

For three of six individual items within the Solitude and Autonomy factor and the individual item "to experience risky situations," there was a significant interaction between pre-post trip differences and use level (Table 9). For "have a sense of solitude" and "get away from crowded situations awhile," very high use visitors were less able to experience what they desire than moderate use visitors. For "be my own boss" (asked pre-trip as "be free to make my own choices") and "experience risky situations," very high use visitors were more able to experience what they desire than moderate use visitors. There were also four experiences for which there was a significant interaction between pre-post trip differences and length of stay. For "be my own boss," overnight visitors achieved more than they desired while day visitors were not able to meet their expectations. For "feel isolated" and "experience risky situations," neither type of visitor had their desires met, but day users were less able to have their desires met. For "get exercise," experience achieved exceeded experience desired for both groups, but pre-post trip differences were smaller for overnight users.

Wilderness Privacy

In addition to exploring the degree to which visitors experienced solitude in wilderness, we were also interested in the functional outcomes of such experiences. For this purpose, we explored the extent to which visitors desired and experienced various privacy functions. Factor analyses of motivations aligned closely with Pedersen's (1997) five privacy functions (Table 10). The most important of the privacy functions was Rejuvenation. The mean score of the two items under this function was 5.5 on a scale of 1 (not at all important) to 7 (extremely important). Somewhat less important were the functions Autonomy and Confiding. The least important functions, Contemplation and Creativity, did not load on separate factors; their mean importance was slightly above the midpoint of 4.

Although visitors to moderate use trails achieved a higher degree of solitude than visitors to very high use trails, they did not experience the functional outcomes of privacy to a higher degree. None of the privacy function factors and none of the

Table 10—Use level effects on experiences achieved^a for experiences related to privacy functions.

Factors and Individual Items	High Use		Mod. Use		ANOVA	
	Mean	S.E.	Mean	S.E.	F	p ^b
Rejuvenation						
To release stress and tension	5.16	0.08	5.26	0.13	0.1	0.71
To feel mentally rejuvenated	4.81	0.09	4.89	0.14	0.1	0.75
Autonomy						
Sense of personal freedom/independence	4.39	0.09	4.89	0.14	0.6	0.45
To feel free to behave as I want	4.31	0.09	4.74	0.15	0.7	0.42
Confiding						
To feel close to my companions	4.31	0.11	4.67	0.17	0.5	0.50
To confide in others I trust	3.27	0.11	3.44	0.17	0.1	0.79
Contemplation and Creativity						
To meditate and reflect	4.19	0.09	4.26	0.16	0.2	0.66
Develop/explore new thoughts and ideas	4.23	0.09	4.30	0.13	0.4	0.51
To discover who I am	3.39	0.09	3.35	0.15	1.8	0.18
To work on solutions to personal problems	3.15	0.10	3.45	0.17	0.4	0.51

^a Means for individual items are responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (extremely). Items are clustered by pre-trip motivation factor.

^b p based on two-tailed tests.

individual items differed significantly between visitors to very high and moderate use trails (Table 10). Whether one was on a day or an overnight trip, in contrast, did have a significant effect on the functional outcomes of privacy. For all of the items other than those related to Rejuvenation, overnight users had higher experience achievement scores than day users (Table 11). Day users were less able to have experiences for all functions other than Rejuvenation. A more detailed treatment of results is available in Cole and Hall (2008a, 2010a).

Attention Restoration Theory

Visitors were asked how much they experienced the wilderness in ways theorized to allow for recovery from directed attention fatigue: fascination, being away, compatibility and

coherence (Kaplan and Kaplan 1989). Of the four domains, visitors were most able to achieve the experiences associated with Fascination (Table 12). Three items (“I felt bored by the environment,” “I was focused on things I had to get done after the trip” and “A feeling that there was too much going on”) were asked in a reverse format—where a high score indicates low achievement. For these items, values in tables have been recalculated to be consistent with other items (by subtracting scores from 7).

There was no evidence that visitors to very high use places in wilderness were less able to experience environments in ways that are conducive to the restoration of attention. None of the domains varied significantly with use level; only one individual item did and, for this item, experience achievement increased as use level increased (Table 12).

Table 11—Length of stay effects on experiences achieved^a for experiences related to privacy functions.

Factors and Individual Items	Day Use		Overn. Use		ANOVA	
	Mean	S.E.	Mean	S.E.	F	p ^b
Rejuvenation						
To release stress and tension	5.19	0.08	5.21	0.17	0.0	0.97
To feel mentally rejuvenated	4.81	0.09	4.89	0.14	0.4	0.53
Autonomy						
Sense of personal freedom/independence	4.35	0.09	4.96	0.17	7.8	<0.01
To feel free to behave as I want	4.31	0.09	4.95	0.17	5.5	0.02
Confiding						
To feel close to my companions	4.30	0.10	4.89	0.19	5.3	0.02
To confide in others I trust	3.14	0.10	4.05	0.21	15.3	<0.01
Contemplation and Creativity						
To meditate and reflect	4.07	0.09	4.77	0.17	11.8	<0.01
Develop/explore new thoughts and ideas	4.17	0.08	4.60	0.17	3.1	0.08
To discover who I am	3.28	0.08	3.76	0.17	4.8	0.03
To work on solutions to personal problems	3.09	0.09	3.84	0.19	8.4	<0.01

^a Means for individual items are responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (extremely).

^b p based on two-tailed tests. For items such as “develop and explore new thoughts and ideas,” where we hypothesized higher scores for overnight users, differences are considered significant when $p \leq 0.10$.

Table 12—Use level effects on achievement of experiences related to attention restoration theory^a.

Factors and Individual Items	High Use		Mod. Use		ANOVA	
	Mean	S.E.	Mean	S.E.	F	p ^b
Fascination						
There was much to attract and hold my attention	5.37	0.09	5.12	0.13	5.5	0.02
I was absorbed in my immediate surroundings	5.28	0.08	5.20	0.12	1.1	0.29
I felt bored by the environment ^c	5.27	0.07	5.19	0.12	0.2	0.62
Being Away						
I felt removed from my daily routines	5.05	0.10	5.39	0.14	0.8	0.36
Away from other people's demands and expectations	4.57	0.11	5.01	0.15	0.4	0.55
I was focused on things I had to get done after the trip ^c	4.16	0.09	4.34	0.15	1.5	0.23
Compatibility						
I felt I could easily handle the problems that arise here	4.69	0.10	5.08	0.14	0.5	0.47
I sensed that I belong here	4.84	0.10	4.70	0.15	3.3	0.07
What I wanted to do was what needed to be done here	4.18	0.11	4.18	0.17	1.0	0.31
Coherence						
I sensed that the elements around me fit together	4.67	0.09	4.71	0.15	0.0	0.85
I felt immediate surroundings were part of larger whole	4.58	0.10	4.69	0.16	0.2	0.68
A feeling that there was too much going on ^c	4.50	0.09	4.65	0.14	0.9	0.35

^a Means for individual items are responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (extremely). Items are clustered by theoretical restorative domain.

^b p based on two-tailed tests.

^c For items asked inversely to other items, scores were subtracted from 7 (i.e. higher scores indicate less agreement with the item)

Whether one was on a day trip or an overnight trip affected more of these experiences, particularly those in the domains Being Away and Compatibility. A more detailed treatment of results is available in Cole and Hall (2008a, 2010b).

Discussion

The objective of this study was to explore the nature of visitor experiences in wilderness and the degree to which experience varies with use levels and length of stay. The very high use places we studied are among the most popular, heavily-used places anywhere in wilderness. Crowds of people are common there and the impacts of use are conspicuous. The moderate use places are more like the conditions that might be provided if use of very popular places was limited. Despite these differences in setting, visitors' assessments of the nature of their experiences were not very different in very high use places than in much more modestly used places.

We asked visitors about 72 different experiences and the degree to which they had each experience. We hypothesized that visitors to very high use trailheads would have lower experience achievement for many of these experiences. We also hypothesized that very high use visitors would have a harder time having the experiences they wanted—that the difference between pre-trip motives and post-trip experience achievement would be greater than for moderate use visitors. We assessed this latter hypothesis by examining the degree of interaction between pre-post trip assessments and use level in analyses of variance.

Our hypotheses were both correct only for the following seven of the 72 experiences: feeling of remoteness; sense that surroundings are not impacted by people; solitude (from the general wilderness experience questions); feeling that solitude

is not interrupted by others; be where it's quiet; get away from crowded situations awhile; and have a sense of solitude (from the Recreation Experience Preference scales).

More experiences and a more diverse array of experiences differed with length of stay. There were 15 experiences for which (1) achievement was lower for day users than overnight users and (2) it was more difficult for day users to have the experience to the degree desired. These were: solitude; challenge; to sense the simplicity of life; to feel free from reliance on modern technology; to sense the dominance of the natural world; to be totally absorbed in what I'm doing; to feel an insignificant part of the world around me; to feel awe and humility; to be my own boss; to feel isolated; to experience risky situations; to feel free to behave as I want; to feel close to companions; to confide in others I trust; and to work on solutions to personal problems.

Driver and Brown (1975) proposed the idea of a recreation demand hierarchy—that it is important to think about recreation demand in terms of activities, settings, experience (psychological) outcomes and enduring benefits. Visitor experience can also be usefully described in these same terms—activities, settings, experience (psychological) outcomes and enduring benefits. In wilderness (as elsewhere), visitors experience the activities they are doing; they also experience the setting (physical, social and managerial) they are doing these activities in. The hiking experience is different from the boating experience and hiking in an urban park is a different experience from hiking a wilderness trail. Engaging in a particular activity (such as hiking) in a particular setting (a remote wilderness without trails) results in psychological outcomes—both transitory (a momentary sense of awe) and enduring (spiritual growth). The more enduring outcomes are often thought of as benefits.

Table 13—Length of stay effects on achievement of experiences related to attention restoration theory^a.

Factors and Individual Items	Day Use		Overn. Use		ANOVA	
	Mean	S.E.	Mean	S.E.	F	p ^b
Fascination						
There was much to attract and hold my attention	5.26	0.08	5.45	0.14	1.4	0.23
I was absorbed in my immediate surroundings	5.18	0.08	5.53	0.14	4.1	0.04
I felt bored by the environment ^c	5.30	0.07	5.02	0.15	3.3	0.07
Being Away						
I felt removed from my daily routines	5.05	0.09	5.58	0.16	4.7	0.03
Away from other people's demands and expectations	4.59	0.10	5.15	0.17	3.5	0.06
I was focused on things I had to get done after the trip ^c	4.29	0.09	3.92	0.19	4.2	0.04
Compatibility						
I felt I could easily handle the problems that arise here	4.66	0.09	5.40	0.13	9.7	<0.01
I sensed that I belong here	4.75	0.09	4.97	0.18	0.7	0.40
What I wanted to do was what needed to be done here	4.07	0.11	4.60	0.19	4.2	0.04
Coherence						
I sensed that the elements around me fit together	4.65	0.09	4.78	0.17	0.2	0.62
Felt immediate surroundings were part of larger whole	4.54	0.10	4.90	0.18	1.8	0.18
A feeling that there was too much going on ^c	4.62	0.08	4.25	0.18	4.9	0.03

^a Means for individual items are responses to questions about how much visitors experienced each item, on a scale from 1 (not at all) to 7 (extremely).

^b p based on two-tailed tests, both for entire factor and individual items. For items such as "away from other people's demands and expectations", where we hypothesized higher scores for overnight visitors, differences are considered significant for $p < 0.10$.

^c For items asked inversely to other items, scores were subtracted from 7 (i.e. higher scores indicate less agreement with the item).

Of these four classes of experiential descriptors, our study focused primarily on experiences expressed in terms of the setting that was experienced (for example, surroundings not impacted by people) or of psychological outcomes for example, to meditate and reflect). All seven of the items experienced less by visitors to very high use places are more descriptors of the setting and conditions that are experienced than of the psychological outcomes of those experiences. Five items refer explicitly to setting attributes conducive to opportunities for solitude—having it, not having it interrupted, being away from crowds and, consequently, being where it's quiet. Closely related are a sense of remoteness and being in a place that has not been impacted much by people.

Even where use level affected what people experience, the magnitude of effect was not large. The largest difference between very high use and moderate use trails, for any of these variables, is 1.3 units on a 7-unit scale. In multiple regression analyses, use never explained more than 25% of the variation in experience achievement and seldom explained more than a few percent. Even where use explained substantial variation, large decreases in amount of use were associated with quite modest increases in experience achievement. One of the common explanations for amount of use not having much effect on visitor satisfaction has been the multi-faceted nature of satisfaction (Manning 1999). In this study, we separated this multi-faceted concept into its individual components and experiences. Use level still had little effect.

None of the experiences that are clearly psychological outcomes were affected by amount of use. Although solitude was affected by use, privacy functions—the purposes served by solitude and privacy—were not affected. Nor were the types of experience that contribute to restoration of direct attention

fatigue—the mental and physical rejuvenation that comes from getting away from the stress, demands and routines of modern life. In interviews with wilderness visitors about their experiences, most visitors characterized their experience as doing an activity in a natural environment with their companions (Hall and others 2007). These experiences—along with peace and quiet—were the most important pre-trip motivations. They were not affected substantially by use level. Nor did use affect the ability to grow personally or spiritually or to experience such attributes as timelessness, simplicity, awe, and humility. What was affected was the ability to experience the setting attributes that are most unique to wilderness—remoteness, lack of human impact, lack of crowds and solitude.

Wilderness experiences were determined more by whether one was staying overnight in the wilderness than by use levels. The experiential domains that varied significantly with length of stay were diverse, with most relating more to the psychological outcomes of experiences than the setting and conditions that were experienced. Magnitudes of difference were similar (typically small) to magnitudes of difference related to use level.

For decades, scientists and managers have been concerned that heavy use changes the nature of recreational experiences and diminishes their quality (Manning 1999). Our research suggests that visitors to very high use wilderness places have experiences that are very similar in nature to those of visitors to less popular wildernesses. Where there is any difference, it is one of degree of achievement.

In relation to Driver and Brown's (1975) proposed hierarchy of experiences, our research suggests that the primary experiential effect of amount of use is on how the setting is experienced. Previous research suggests that the

activities visitors participate in do not vary much with use level (Roggenbuck and Lucas 1987). We found surprisingly little effect on psychological outcomes—either transitory (for example, a sense of awe) or longer-lasting (for example, physical revitalization). Although we did not study enduring benefits, there is little reason to think they would differ given the lack of difference in psychological outcomes. Indeed, Patterson and others (1998) and Glaspell (2002) explored the meanings of wilderness experience (on the basis of in depth interviews) in highly divergent wilderness settings (the heavily-used, mostly day use Juniper Springs Wilderness in Florida and the remote Gates of the Arctic Wilderness in Alaska). Although the details of what was experienced obviously differed, the domains of meaning that visitors drew from those experiences (such as challenge and being close to nature) were remarkably similar between the two wildernesses.

Most previous studies of day and overnight visitors have concluded that the trip motivations of the two groups differ, with day users being less interested in a “true” wilderness experience. In Montana wilderness, Grossa (1979, p. 125) concluded that “day users...are visiting the wilderness for recreational activities and other pursuits which are not dependent exclusively on a truly wilderness environment.” In the Shenandoah Wilderness, in Virginia, Papenfuss et al. (2000, pp. 152 and 153) conclude that “few day visitors see the trip as primarily a wilderness one” and that “day visitors were seeking something other than a wilderness trip.” Cole (2001) speculated that expectations may differ more than motivations—that day users may want most of the same experiences as overnight visitors (including true wilderness experiences), but that they know from previous experience that they are less likely to achieve them. In our study, we did not assess expectations. However, we did find that day and overnight users differed more in experience achievement than in experience motivation. Motivations were significantly different for 20 items, while achievement was significantly different for 38 items. Clearly day users had less intense desires than overnight users for many of the experiences we asked about; they were also less able to have most of these experiences to the degree that overnight users did.

Management Implications

Very popular places in wilderness had a very different social setting from less popular places. For example, visitors to our very high use places reported a mean of 16 encounters with other groups per day and being in sight of other groups 30% of the time. In contrast, visitors to moderate use places had a mean of 5 encounters per day and were in sight of others 8% of the time. Visitors to very high use places experienced conditions that were not entirely consistent with the wilderness ideal. They experienced crowds and surroundings that had been impacted by people. This caused them to feel somewhat less remote and to experience somewhat less solitude and quiet. However, these were the only experiences we studied that differed between very high use and moderate use wilderness.

The psychological outcomes derived from wilderness visits were as substantial in very high use wilderness as they were in less heavily used places. This suggests that the enduring personal and social benefits of a wilderness trip may not be greatly diminished in very high use places. Experiences in very high use wilderness were different—because a few attributes of the setting differed—but it seems misleading to state, from the perspective of the visitor, that they were substantially lower in quality.

Much more important to experience quality than amount of use was length of stay. Many more experiences varied with length of stay than with use level. If the goal is to increase opportunities for desired psychological outcomes of a wilderness trip, convincing people to stay out overnight would be more effective and beneficial than reducing use levels. But, even for length of stay, the magnitude of difference in experience was small.

Use has already been limited in some wildernesses and there are many advocates for more widespread use limits. There are both biophysical and social reasons for such limits. Research we have reported elsewhere suggests that visitors are more supportive of biophysical reasons for limits (less impact on plants, soil and wildlife) than social reasons (Cole and Hall 2008b). If the reason for limits is social, our research suggests that managers should provide a rationale other than to provide higher quality experiences. Even in very high use wilderness, visitors had high quality experiences, realizing many desired psychological outcomes that are likely to have substantial enduring personal and social benefits. What differed was primarily the setting that was experienced. In very high use wilderness, visitors experienced less of several attributes that lie close to the core of what wilderness is. They experienced less remoteness, solitude and quiet and they were confronted with more human impact.

Our research suggests that the primary experiential justification for use limits should be to maximize opportunities to experience wilderness as a unique setting that simultaneously provides a high degree of remoteness, primitiveness, solitude and perceived naturalness. To paraphrase the Wilderness Act, use limits can increase opportunities to experience wilderness “as wilderness.” This obviously is justifiable—even necessary—at least in some places. But there is little evidence that limits will consistently lead to substantially different or higher quality experiences. Moreover, managers should understand that most visitors do not consider the benefits of experiencing a wilderness with less people and more solitude to be equal to the cost associated with being denied access (Cole and Hall 2008b). In part this is because, even in very high use wilderness, visitors find most of the attributes they are seeking and have most of the experiences they desire (Hall and others 2007). Moreover, they know that there are many other wilderness destinations that provide less crowded conditions, where they can go when those attributes are important to them (Cole and Hall in press).

References

- Altman, Irwin. 1975. *The environment and social behavior*. Monterey, CA: Brooks/Cole. 256 p.
- Borrie, William T.; Roggenbuck, Joseph W. 2001. The dynamic, emergent, and multi-phasic nature of on-site wilderness experiences. *Journal of Leisure Research*. 33: 208-228.
- Brown, Perry J.; Haas, Glenn E. 1980. Wilderness recreation experiences: the Rawah case. *Journal of Leisure Research*. 12: 229-241.
- Cole, David N. 2001. Day users in wilderness: how different are they? Res. Pap. RMRS-RP-31. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 29 p.
- Cole, David N.; Hall, Troy E. 2008a. Visitor experiences in wilderness: How they vary with amount of use and length of stay. Aldo Leopold Wilderness Research Institute [Online] <http://leopold.wilderness.net/unpublished/UNP124.pdf>.
- Cole, David N.; Hall, Troy E. 2008b. Wilderness visitors, experiences, and management preferences: How they vary with use level and length of stay. Res. Pap. RMRS-RP-71. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 61 p.
- Cole, David N.; Hall, Troy E. 2010a. Privacy functions and wilderness recreation: Use density and length of stay effects on experience. *Ecopsychology*. 2: 67-75.
- Cole, David N.; Hall, Troy E. 2010b. Experiencing the restorative components of wilderness environments: Does congestion interfere and does length of exposure matter? *Environment and Behavior*. 42: 806-823.
- Cole, David N.; Hall, Troy E. In press. Wilderness experience quality: Effects of use density depend on how experience is conceived. In: Cole, David N., comp. *Wilderness visitor experiences: Progress in research and management*; 2011 April 4-7; Missoula, MT. Proc. RMRS-P-66. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
- Dawson, Chad P.; Hammitt, William E. 1996. Dimensions of wilderness privacy for Adirondack Forest Preserve hikers. *International Journal of Wilderness*. 2(1): 37-41.
- Driver, B. L.; Brown, Perry J. 1975. A socio-psychological definition of recreation demand, with implications for recreation resource planning. In: *Assessing demand for outdoor recreation*, Appendix A. Washington, DC: National Academy of Sciences. 123 p.
- Driver, B. L.; Nash, Roderick; Haas, Glenn. 1987. Wilderness benefits: a state-of-knowledge review. In: Lucas, Robert C., comp. *Proceedings—national wilderness research conference: issues, state-of-knowledge, future directions*. Gen. Tech. Rep. INT-220. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 294-319.
- Gaspell, Brian S. 2002. *Minding the meaning of wilderness: investigating the tensions and complexities inherent in wilderness visitors' experience narratives*. Dissertation. Missoula, MT: University of Montana. 248 p.
- Graber, Linda H. 1976. *Wilderness as sacred space*. Washington, DC: Association of American Geographers. 124 p.
- Grossa, John, Jr. 1979. *Recreation preferences and appterns among users of wilderness and backcountry areas in western Montana*. Dissertation. East Lansing, MI: Michigan State University. 162 p.
- Hall, Troy E.; Johnson, Bradley J.; Cole, David N. 2007. Dimensions of wilderness experience: a qualitative investigation. Aldo Leopold Wilderness Research Institute [Online] http://leopold.wilderness.net/research/fprojects/docs7/qual_interview_rept_final.pdf.
- Hammitt, William E. 1982. Cognitive dimensions of wilderness solitude. *Environment and Behavior*. 14: 478-493.
- Hammitt, William E. In press. Wilderness naturalness, privacy, and restorative experiences: An integrative model. In: Cole, David N., comp. *Wilderness visitor experiences: Progress in research and management*; 2011 April 4-7; Missoula, MT. Proc. RMRS-P-66. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
- Hammitt, William E.; Madden, Mark A. 1989. Cognitive dimensions of wilderness privacy: a field test and further explanation. *Leisure Sciences*. 11: 293-301.
- Hammitt, William E.; Rutlin, William M. 1995. Use encounter standards and curves for achieved privacy in wilderness. *Leisure Sciences*. 17: 245-262.
- Herzog, Thomas R.; Maguire, Colleen P.; Nebel, Mary B. 2003. Assessing the restorative components of environments. *Journal of Environmental Psychology*. 23: 159-170.
- Kaplan, Rachel. 1984. Wilderness perception and psychological benefits: an analysis of a continuing program. *Leisure Sciences*. 6: 271-290.
- Kaplan, Rachel; Kaplan, Stephen. 1989. *The experience of nature: a psychological perspective*. New York: Cambridge University Press. 340 p.
- Kaplan, Stephen. 1995. The restorative benefits of nature: toward an integrated framework. *Journal of Environmental Psychology*. 15: 169-182.
- Kaplan, Stephen. 2001. Meditation, restoration, and the management of mental fatigue. *Environment and Behavior*. 33: 480-506.
- Manfredo, Michael J.; Driver, B. L.; Brown, Perry J. 1983. A test of concepts inherent in experiences based setting management for outdoor recreation areas. *Journal of Leisure Research*. 15: 263-283.
- Manfredo, Michael J.; Driver, B.L.; Tarrant, Michael A. 1996. Measuring leisure motivation: a meta-analysis of the recreation experience preference scales. *Journal of Leisure Research*. 28: 188-213.
- Manning, Robert E. 1999. *Studies in outdoor recreation: search and research for satisfaction*. 2nd ed. Corvallis, OR: Oregon State University Press. 374 p.
- Marshall, Nancy J. 1974. Dimensions of privacy preferences. *Multivariate Behavioral Research*. 9: 255-271.
- Papenfuss, Meghan K.; Roggenbuck, Joseph W.; Hall, Troy E. 2000. The rise of the day visitor in wilderness: should managers be concerned? In: Cole, David N.; McCool, Stephen F.; Borrie, William T.; O'Loughlin, Jennifer, comps. *Wilderness science in a time of change conference—Volume 4: wilderness visitors, experiences and visitor management*. Proc. RMRS-P-15-VOL-4. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 148-154.
- Patterson, Michael E.; Watson, Alan E.; Williams, Daniel R.; Roggenbuck, Joseph R. 1998. An hermeneutic approach to studying the nature of wilderness experiences. *Journal of Leisure Research*. 30: 423-452.
- Pedersen, Darhl M. 1997. Psychological functions of privacy. *Journal of Environmental Psychology*. 17: 147-156.
- Pedersen, Darhl M. 1999. Model for types of privacy by privacy functions. *Journal of Environmental Psychology*. 19: 397-405.
- Priest, Simon; Bugg, Richard. 1991. Functions of privacy in Australian wilderness environments. *Leisure Sciences*. 13: 247-255.
- Roggenbuck, Joseph W.; Lucas, Robert C. 1987. Wilderness use and user characteristics: a state-of-knowledge review. In: Lucas, Robert C., comp. *Proceedings—national wilderness research conference: issues, state-of-knowledge, future directions*. Gen. Tech. Rep. INT-220. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 204-245.
- Shafer, C. Scott; Hammitt, William E. 1995. Congruency among experience dimensions, conditions indicators, and coping behaviors in wilderness. *Leisure Sciences*. 17: 263-279.
- Stankey, George H.; Baden, John. 1977. *Rationing wilderness use: methods, problems, and guidelines*. Res. Pap. INT-192. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 20 p.
- Stankey, George H.; Schreyer, Richard. 1987. Attitudes toward wilderness and factors affecting visitor behavior: a state-of-knowledge review. In: Lucas, Robert C., comp. *Proceedings—national wilderness research conference: issues, state-of-knowledge, future directions*. Gen. Tech. Rep. INT-220. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 246-293.
- Stewart, William P.; Cole, David N. 2001. Number of encounters and experience quality in Grand Canyon National Park: consistently negative and weak relationships. *Journal of Leisure Research*. 35: 106-120.
- Talbot, Janet Frey; Kaplan, Stephen. 1995. Perspectives on wilderness: re-examining the value of extended wilderness experiences. In: Sinha, Amita, ed. *Landscape perception*. London: Academic Press. 137-148.
- Westin, Alan F. 1967. *Privacy and freedom*. New York: Atheneum. 487 p.