Journal of Leisure Research
2001, Vol 33, No 1, pp 106-120

Copyright 2001
National Recreation and Park Association

Number of Encounters and Experience Quality in Grand Canyon Backcountry: Consistently Negative and Weak Relationships

William P. Stewart
Department of Leisure Studies, University of Illinois
David N. Cole
Aldo Leopold Wilderness Research Institute, Missoula, Montana

The relationship between encounters and the overall quality of recreation experience is one of the most common research topics in outdoor recreation. Yet after more than three decades of study, there remain divergent opinions about both the nature of this relationship and its implications for use limits. Evidence for a strong influence of encounters on experience quality is weak but it is unclear whether this means the relationship itself is weak or that the methods used to isolate the relationship have been inadequate. This paper explores relationships between number of encounters, crowding, solitude/privacy achieved, and overall experience quality for 185 backcountry visitors to Grand Canyon National Park. In contrast to most past research, we employed a diary-like method to control for variation in person-based effects (e.g., differences in expectations and motivations between individuals) and we used a multi-item scale to capture more variation in total experience quality. Our results indicate that there is a consistently negative but weak relationship between number of encounters and experience quality. In other words, most backpackers were negatively affected by encountering more groups, but the resultant effect was small. This implies that managers should be reluctant to justify use restrictions on the basis of higher quality experiences and that user-based empirical research is of limited utility in grappling with such restrictions. Echoing the 35-year-old suggestions of Wagar, the original student of recreational carrying capacity, a careful understanding of the regional supply and demand for different types of recreation experiences, including low density experiences, are more likely to provide the basis for wise decisions about use limits

KEYWORDS: *Situational effects, crowding, solitude, experience quality*

Introduction

Research on the influence of setting attributes on recreational experiences has been a prominent tradition in the leisure literature. The basic goal of such research is usually an improved understanding of how recreationists perceive, behave in, and respond to recreational settings. Of the many setting attributes that have been studied, none have received as much attention from

A previous version of this paper was presented at the NRPA Leisure Research Symposium, Kansas City, MO, October 23-27, 1996. The authors appreciate the statistical help of Debby Kashy, formerly of the Department of Psychology, Texas A&M University. William P. Stewart may be contacted at the Department of Leisure Studies, University of Illinois, Champaign, IL 61820.

Copyright © 2001 All Rights Reserved

GCMRC Library
DO NOT REMOVE

715.00
LND-8.00
S852n

recreation researchers as use density and the frequency and nature of encounters with other groups.

An important goal of the search for relationships between encounters and recreation experiences has been its implications for use limits. The growing popularity of wildland recreation has led many managers to limit use of rivers, parks, and wilderness areas. In their search for use limits that are justifiable, managers have frequently turned to social science. In the process, recreational carrying capacity and crowding have become perhaps the most studied topics in outdoor recreation research. While there is general agreement that this research has improved our understanding of the complex relationship between use density and the quality of recreation experiences, there are divergent opinions about the extent to which this research has improved management decisions about use limits. Shelby and Heberlein (1986), for example, have championed the ability of science to provide an empirical basis for carrying capacity decisions. Burch (1981, 1984) and Becker, Jubenville and Burnett (1984), in contrast, consider the interpretations of many carrying capacity studies to be irresponsible and dishonest, having "more to do with coinciding lines of ideology held by the manager and the researcher than by the empirical data" (Burch, 1981, p. 227).

In his seminal, conceptual discussion of recreation carrying capacity, Wagar (1964) asserted two axioms (1) that the goal of management is to provide opportunities for high quality recreation experiences and (2) that quality depends on how well recreation opportunities satisfy the needs that motivate people to engage in recreation activities. He hypothesized that as the number of people increases, the ability of a recreation area to satisfy some (but not all) recreational motivations will decline, with solitude being the motivation most sensitive to increased use. He concluded that use limits are appropriate when recreationists prefer "less recreation" (the cost of use limits) to "the reduction in quality that would accompany. . . increased crowding" (the cost of not implementing use limits).

From this perspective, use limits seem justified if (1) increased use and encounters between wilderness travelers results in crowding, decrease in solitude, and reduction in the overall quality of the experience; and (2) the magnitude of reduction in overall experience quality is substantial enough to suggest that the benefits of limiting use (increased quality of experience) exceed the costs (less recreation due to restricted access). Numerous empirical studies have tested the hypothesis that use density (or encounters) is negatively correlated with experience quality (Manning, 1999, Chs. 4-5; Shelby, Vaske, & Heberlein, 1989). Since Wagar's time, three basic approaches have been taken, with differences reflecting the dependent variable selected and whether relationships are assessed under hypothetical or actual conditions.

Three Approaches to Research

The initial approach involved assessing, under actual conditions, the extent to which quality of the entire experience was reduced as user density

Copyright © 2001 All Rights Reserved

or encounters increased. "Quality of the experience" is often referred to as "total satisfaction" although the concept of satisfaction may be both limiting and unnecessary (Williams, 1988). Many satisfaction scales have simply asked for an evaluation of trip quality, rather than how "satisfied" people are (Shelby & Heberlein, 1986, p. 130). As has been well-documented elsewhere (see reviews by Kuss, Graefe, & Vaske 1990; Manning, 1999), the effect of density and encounters on overall experience quality is generally weak to nonexistent. In studies where *r-square* has been used to assess percent variation in quality, values for the explanatory power of density or encounters have not exceeded 10%. Using *gamma* as a measure of association, however, Lucas (1980) reported the percent variation in quality explained by encounters exceeded 10% in six of nine wildernesses studied, with one value as high as 31%. It is unclear whether this larger magnitude of relationship reflects differences in instrumentation and statistical analysis or differences in the relationship between encounters and experience quality in the study areas.

The second approach, which used field studies, was based on a more elaborate "crowding model," in which other variables mediate the relationship between density (or encounters) and total experience quality. The most common hypothesis was that user density influences perceived crowding which, in turn, influences experience quality. In 24 of the 27 studies reported by Kuss, Graefe, and Vaske (1990), density or encounters had a stronger effect on perceived crowding than on experience quality. In most cases, relationships were statistically significant but, in all but a few cases, less than 10% of the variation in crowding could be explained by density or encounters. In a related approach, Hammitt and Rutlin (1995) reported that visitors' evaluations of "desired privacy achieved" declined as number of encountered groups increased, but they did not evaluate either the strength of association or the importance of privacy achievement to quality. Where the effect of perceived crowding on experience quality has been assessed, the strength of association is generally weak. In 12 studies reviewed in Kuss, Graefe, and Vaske (1990) and an additional study conducted by Herrick and McDonald (1992), the percent of variation explained by perceived crowding did not exceed 5%.

The third approach has been to ask people directly, but in a hypothetical manner, about the effects of encounters on their experience. This has been operationalized in several different manners. Visitors have been asked about both preferred numbers of encounters and maximum acceptable numbers of encounters. They have been asked to assess their likely response to different numbers of encounters, presented either verbally (Stankey, 1973) or visually (Manning, Lime, Freimund, & Pitt, 1996). They also have been asked to give their highest tolerable contact level (Hall & Shelby, 1996). Using this approach, referred to variously as satisfaction curves, preference curves, acceptability curves, or encounter norms, researchers have focused on the independent variable of number of encounters and have explored its relationship with various dependent variables. It is critical to note that in this third approach, the dependent variables are related to evaluation of "the number

Copyright © 2001 All Rights Reserved

of people seen" rather than "the entire experience" (Shelby, 1980, p. 47). This construct, evaluation of the number of people seen, is much more narrowly focused on the detrimental effects of encounters and is not synonymous with total experience quality. As an additional concern of this third approach, its reliance on hypothetical scenarios to generate responses to backcountry situations is a technique whose validity has been questioned in several contexts (Lee, 1977; Williams, Roggenbuck, Patterson, & Watson, 1992).

After more than 20 years of research, the empirical basis for setting use limits is not convincing. The rationale for basing carrying capacity assessments on either perceived crowding or acceptability curves, which is the dominant paradigm at the present time (Manning, Lime, Freimund & Pitt, 1996; Shelby, Vaske & Donnelly, 1996), still relies on the unproven proposition that the benefits of avoiding increased number of encounters exceed the costs of restricting access. In other words, Wagar's conclusion, that use limits are appropriate when the benefits to experience quality exceed the costs of less recreation, has not been adequately addressed by research. It is quite plausible that the decline in experience quality that results from feeling crowded may be small when compared with the benefits that accrue from being able to engage in a recreational activity whenever one so desires. If this were the case, it might explain the finding that relatively few visitors support reductions in use levels, even when they feel crowded (Cole, Watson, Hall & Spildie, 1997; West, 1981). It might also explain the finding that total experience quality is related more to group behavior and setting attributes than to perceived crowding (Herrick & McDonald, 1992; Shelby, 1980).

Explanations for Weak Relationships with Experience Quality

Several reasons have been suggested to explain the weak relationship between encounters or perceived crowding and experience quality (Heberlein, 1977; Manning, 1999; Shelby & Heberlein, 1986). One of the foremost explanations is that individuals vary greatly in their response to use density and encounters. They vary in motivations, expectations, and preferences, as well as on their ability to cope with various encounter levels (Manning, 1999; Shelby & Heberlein, 1986). This inter-subject variability may mask underlying relationships between encounters and experience quality. Research designs capable of controlling for inter-subject variability would result in assessments more sensitive to experiential changes due to number of encounters (Bishop & Witt, 1970; Shelby & Heberlein, 1986, p. 100; Stewart & Cole, 1999; Williams, Roggenbuck, Patterson, & Watson, 1992).

Another research problem has been the instrumentation of the dependent variable, experience quality. Single item measures typically have not exhibited substantial variation and have been criticized as being insensitive to the multi-dimensionality of experience quality (Heberlein, 1977; Ditton, Graefe & Fedler, 1981). Use of a multi-item scale of experience quality (Schomaker & Knopf, 1982, who refer to their scale as assessing "overall satisfac-

Copyright © 2001 All Rights Reserved

tion") might provide a better opportunity to capture the breadth of total experience quality and to provide more variation in the dependent variable.

Like many studies of the past, our purpose is to understand the relationship between encounters and experience quality. We are not convinced that there is a strong relationship between encounters and experience quality. Therefore, our strategy was to maximize the probability of finding evidence of a strong relationship, if it exists, by using a research design that is more effective at uncovering the relationship compared to earlier approaches and by isolating sub-populations for which encounters might be an unusually salient attribute. Inability to find strong evidence even under these circumstances would suggest that weak evidence of a relationship is more reflective of a weak relationship than of methodological problems.

We conducted a field study of overnight backpackers in Grand Canyon National Park to assess the effect of number of encounters on experience quality (using the multi-item scale developed by Ditton, Graefe, & Fedler, 1981), perceived crowding, and solitude/privacy achieved. To remove inter-subject variation from our assessment of the effect of encounters on quality, we used a repeated measures sampling approach that collected several data points from each study participant. Further, we hypothesized that the effect of encounters on experience quality might be stronger among visitors who seek-out low density locations or who reported that solitude/privacy achievement was a primary motivation for their trip. We tested these hypotheses by comparing (1) visitors who selected relatively low density locations with visitors who selected high density locations and (2) visitors for whom solitude and privacy was very important to their trip with visitors who felt these experiences were not as important.

Method

In this study, each participant is treated as a separate sample with multiple observations, one for each day of their trip. Observations, reported each day in a diary, assessed situational variables and participants' evaluations of their experiences.

Participants

Overnight backpackers to Grand Canyon National Park, who made advanced reservations for a trip of four or more nights in length, were sampled during 1994 fall (October and November) and 1995 spring (March through May) hiking seasons. They varied in the location of their backpacking trip. Twenty-three percent of participants backpacked only in the well-developed area of Grand Canyon's backcountry, referred to as the Corridor (which contains the Bright Angel and Kaibab Trails, along with three ranger patrolled campgrounds), 44% traveled in the remote backcountry of Grand Canyon that did not include the Corridor trails, and 33% traveled both inside and outside of the Corridor.

Copyright © 2001 All Rights Reserved

Procedure

The sampled permittees were invited to participate in the study, and if the invitation was accepted, participants were mailed a pre-trip questionnaire and an onsite questionnaire packet containing a form for each day of their hike. They were instructed to complete the pre-trip questionnaire and return it prior to leaving for their trip, and to bring the questionnaire packet with them on their hike and complete a questionnaire at the end of each day of their backpacking trip. Also enclosed in the pre-trip mailing were two self-addressed stamped envelopes to facilitate return of the pre-trip questionnaire and onsite questionnaire packet.

Of the 452 advanced reservation permittees that were invited to participate in the study, 328 (73%) accepted the invitation, 11 (2%) rejected the invitation, and 113 (25%) did not respond to the invitation post-card. Of the 328 who accepted the invitation, 198 (60%) completed their pre-trip and onsite questionnaires. A follow-up study was conducted to investigate mortality (i.e., drop-outs) and those not responding to the initial invitation. Of the 143 (out of 452 who were original sampled) non-respondents and drop-outs who provided information, 73% reported canceling their planned trip to Grand Canyon, 13% reported mail delivery problems, and 10% lost or misplaced their questionnaires. One reason for the high trip cancellation rate was the closure of Corridor trails by flooding during spring 1995. For a couple of weeks in March, park staff were calling permittees with March and April reservations and canceling their reservation due to expected poor trail conditions.

Measures

Three dependent variables were assessed: experience quality, perceived crowding, and solitude/privacy achieved. Experience quality was assessed using a five item measure (Ditton, Graefe, & Fedler, 1981; Schomaker & Knopf, 1982); a summed-scale from the raw scores was developed as an experience quality index (Cronbach's alpha = 0.64). Perceived crowding was assessed using a modified version of Shelby, Vaske, and Heberlein's (1989) single item measure. For consistency with the other items of the questionnaire, instead of a nine-point response category, the item of this study used a seven-point response category with "not at all crowded" as the label for "1" and "extremely crowded" as the label for "7."

Solitude/privacy achieved was measured through a modified Recreation Experience Preference (REP) scale (Driver, Tinsley, & Manfredo, 1991) in which participants were asked to "circle the number that represents the *degree to which you experienced* each of the following today" for 14 items which indicated various experiential domains. A seven-point response scale ranging from "not at all" to "very much" was used. An experiential domain containing the items "solitude," "privacy," and "tranquility" emerged from a factor analysis on these 14 items which is being referred to as solitude/privacy achieved. A summed-scale from the raw scores of these three items was de-

Copyright © 2001 All Rights Reserved

veloped as an index for solitude/privacy (Cronbach's alpha = 0.80). To stratify participants on the strength of their motivation for solitude/privacy, the pre-trip questionnaire asked them to "indicate how important each of the following experiences are to you for your upcoming trip." The pre-trip assessment was intended to measure motivation, rather than achievement, for solitude/privacy. See Table 1 for a summary of operations.

Analyses

The analysis was a two-step process that treated each participant as a separate sample with several data points, one for each day of their trip (cf., Kenny, Kashy, & Bolger, 1997; Depaulo et al., 1996). For the *first* step, a regression model was developed for each participant based upon the collection of his/her daily self-reports. Since participants completed a questionnaire each day of their trip, there were 5 to 15 data points for each participant across the days of their hike. For the analyses presented, there were 935 sets of data points related to the 185 participants. Regression analyses were conducted for each participant across the days of their hike. The individual regression analyses of each participant's data set are simple regres-

TABLE 1
Operations

Index for satisfaction[a] (Cronbach's alpha = 64)
1. I thoroughly enjoyed today.
2. I cannot imagine a better place to be than in this backcountry
3. My trip here is well worth the cost
4. I do not want to have any more days like this one
5. I was disappointed with some aspects of today.

Index for solitude[b] (Cronbach's alpha = 80)
1. Solitude
2. Tranquility
3. Privacy

Crowding item[c]
1. How crowded did you feel today?

Number of encounters item[d]
A. About how many other groups of people did you encounter today?

[a]Participants were asked "How strongly do you agree or disagree with the following." Response categories were a 7-point scale, anchored at "strongly disagree" and "strongly agree."

[b]Context was 14 experientially-based items, adapted from Driver's REP scales. Participants were asked to "Please circle the numbers that represents the *degree to which you experienced* each of the following today." Response categories were a 7-point scale, anchored at "not at all" and "very much."

[c]Response categories were a 7-point scale, anchored at "not at all crowded" and "extremely crowded."

[d]Response format was a blank line. A square root transformation was conducted on this item prior to analysis to address its positive skew

Copyright © 2001 All Rights Reserved

sions (i.e., bivariate) due to degree of freedom constraints (since the median number of nights in a trip was 6, the median number of data points was 7 sets). A square-root transformation was conducted on "number of groups encountered" to account for its positive skew (i.e., a Poisson distribution; see Kenny, 1987, p. 78).

For the *second* step of the analysis, statistical tests were conducted on the aggregation of participants' regression coefficients. The 185 individual regression coefficients were pooled, and assessed for consistency and magnitude. In other words, the results of this study are presented as summary statistics on the collection of individual regression coefficients. Consistency of relationship is indicated by the proportion of coefficients greater than or less than zero, and a *t-test* of whether the *mean* slope is different from zero. The magnitude of effect was assessed by calculating *mean* slope coefficients for segments of the sample with positive and negative slopes.

Results

The sample was typical of that reported in many other studies of backcountry hikers. Of the participants who completed the study, 23% were female, more than three-fourths had completed a four-year college degree, and 98% were white, not of Hispanic origin. Almost half were in groups of two or less and 91% were in groups of 6 or less. Only 4% of the groups included children and 13% included teenagers.

The *mean* number of other groups that these backpackers encountered was about 7 groups per day, but encounters were both highly skewed and highly variable (Table 2). The *median* number of encounters was 3 per day and participants saw one other group or less on 25% of days. However, on 10% of days they saw more than 40 other groups. Dependent variables also exhibited substantial variation, although variation in experience quality ratings was much less pronounced than variation in perceived crowding and

TABLE 2
Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max.	Percentiles 90%	75%	50%	25%	10%
Groups Encountered per Day	6.8	5.7	0	80	10	15	3	1	0
Experience Quality Index[a]	5.9	1.0	1.4	7.0	7.0	6.8	6.2	5.4	4.6
Perceived Crowding[b]	2.7	1.9	1	7	6	4	2	1	1
Solitude/Privacy Achieved Index[c]	4.9	1.5	1.0	7.0	6.7	6.0	5.0	4.0	2.7

Note: $n = 935$

[a] 1 (low experience quality) to 7 (high experience quality)

[b] 1 (not at all crowded) to 7 (extremely crowded)

[c] 1 (solitude/privacy not at all achieved) to 7 (solitude/privacy very much achieved)

Copyright © 2001 All Rights Reserved

solitude/privacy achieved. For example, experience quality ratings were 4.6 or less, on a scale of 1 (low quality) to 7 (high quality), on just 10% of the days. In contrast, perceived crowding exceeded 4, on a scale of 1 (not crowded) to 7 (extremely crowded), on 25% of the days and solitude/privacy achieved was less than 4.0, on a scale of 1 (low solitude) to 7 (high solitude), on 25% of the days.

Effects of Increasing Numbers of Encounters

For 60% of participants, Table 3 indicates there was a significant negative relationship between the number of groups encountered and their evaluation of experience quality. For 21% of participants, this relationship was positive and for 19% there was not a significant relationship (i.e., slopes of regression lines were approximately zero).

The magnitude of influence is small, however, even when only those with negative slopes are considered. For the 60% of the sample with negative slopes, the *mean* slope was −0.41, indicating that for each unit increase in groups encountered per day, experience quality decreased by 0.41 units (about 7% of the 7 point scale). From this we can predict that increasing encounters per day from 1 to 4, from 4 to 9, or from 16 to 25 would reduce

TABLE 3
Predicting Experience Quality, Perceived Crowding, and Solitude/Privacy Achieved

	Variation of Slopes				
Predictor Variable. Independent Variable	Less than −1	Less than 0 (*mean* slope)[a]	Equal to 0[b]	Greater than 0 (*mean* slope)	Greater than 1
Experience Quality					
Groups Encountered[c]	5%	60% (−.41)	19%	21% (.39)	2%
Perceived Crowding	2%	50% (−.28)	30%	19% (.34)	1%
Solitude/Privacy Achieved	2%	19% (−.32)	14%	68% (.47)	6%
Perceived Crowding:					
Groups Encountered[c]	3%	5% (−1.28)	15%	80% (1.00)	32%
Solitude/Privacy Achieved:					
Groups Encountered[c]	14%	77% (−.69)	8%	15% (.49)	3%

Note: Each row indicates the summary statistics from 185 individual regression coefficients. The % in each row represents the proportion of sample with the given level of slope coefficient.
[a]The mean slope represented in parentheses reflects the average regression coefficient of all participants whose regression coefficients were less than 0, including those whose coefficients were less than −1.
[b]The percentage reported in this column is approximately equal to zero at plus or minus .05
[c]The variable used in regression equations was "square root of groups encountered" due to positive skew.

Copyright © 2001 All Rights Reserved

quality about 7% on average. All other things equal, encounters would have to increase from 1 to 81 per day or from 4 to 100 per day to reduce experience quality 50% on average, even when only those who are negatively affected by encounters are considered. There are, however, a few people for whom experience quality is strongly affected by number of encounters. Five percent of participants had slopes steeper than −1.0. For these people, an increase in number of encounters from 1 to 16 per day or from 4 to 25 per day would reduce experience quality by 50%.

The effect of encounters on perceived crowding is both more consistent and of greater magnitude when compared to the effect of encounters on experience quality. For 80% of participants, there was a significant positive relationship between number of encounters per day and perceived crowding (Table 3). For just 5% the slope was negative. Moreover for the 80% of the sample with positive slopes, the *mean* slope was 1.0, indicating that for each unit increase in groups encountered per day, perceived crowding increased 1.0 unit (about 17% of the 7 point scale). From this we can predict that perceived crowding would increase about 50% on average if encounters increased from 1 to 16 per day or from 4 to 25 per day. There were 32% of participants who had slopes greater than 1.0, suggesting that they are even more sensitive to encounters.

Solitude/privacy achieved is more consistently and strongly affected by number of encounters than experience quality, but less affected than perceived crowding. For 77% of participants, there was a significant negative relationship between number of encounters per day and solitude/privacy achieved (Table 3). For this 77% of the sample, the *mean* slope was −0.69, indicating that for each unit increase in groups encountered per day, solitude/privacy achieved decreased 0.69 units (about 12% of the 7 point scale). From this we can predict that solitude/privacy achieved would decrease about 50% on average if encounters increase from 1 to 28 per day or from 4 to 40 per day. Fourteen percent of participants had slopes less than −1.0, suggesting their sense of solitude/privacy was strongly affected by number of encounters.

Effects of Crowding and Solitude/Privacy on Experience Quality

Although there is a strong relationship between number of encounters and both perceived crowding and solitude/privacy achieved, the remaining question is whether perceived crowding or solitude/privacy achieved have consistent and substantial effects on experience quality. The results indicated that the effect of perceived crowding on experience quality is neither consistent nor strong. For 50% of participants, there was a significant negative relationship between perceived crowding and experience quality (Table 3). Even if we only consider this 50% of the sample, the *mean* slope is just −0.28. Moving from extremely crowded (7 on the scale) to not at all crowded (1 on the scale) would on average be related to a 28% reduction in experience

Copyright © 2001 All Rights Reserved

quality. Just 2% of the sample had slopes steeper than −1.0, indicating that the experience quality of a very small proportion of participants was very sensitive to perceived crowding.

Experience quality is more consistently and strongly affected by the degree to which solitude/privacy was achieved. For 68% of participants, there was a significant positive relationship between solitude/privacy achieved and experience quality. However, the magnitude of relationship was not large. The mean slope of the 68% of the sample with a positive slope was 0.47. Moving from maximum to minimum solitude would on average be related to a 50% reduction in experience quality. Just 6% of the sample had slopes steeper than 1.0, indicative that the experience quality for this segment is very sensitive to achieving solitude/privacy.

Sub-populations that Might be Responsive to Encounters

Participants who hiked in locations of relatively low use density may be more sensitive to encounters compared to participants who hiked in high density locations. To test this hypothesis, analyses were conducted that split participants in two groups: participants who camped most of the time in the Corridor (n = 73), and those who camped most of the time outside the Corridor (n = 110). These analyses (table not shown) did not exhibit significantly different coefficients or distributions between the two groups. For example, on the relationship between encounters and experience quality for the Corridor and Non-corridor groups, the *mean* coefficients were both −0.18 and not significantly different than one another.

From the pre-trip questionnaire, participants who reported solitude/privacy as being relatively important for their upcoming backpacking trip may have been more sensitive to encounters compared to participants who reported solitude/privacy as less important. To test this hypothesis, analyses were conducted that split participants into two groups: participants whose pre-trip solitude motivation score was 6 or 7 (on a 7 point scale) were considered to be strongly motivated for solitude/privacy (n = 136); and those with scores below 6 were considered to be weakly motivated for solitude/privacy (n = 50). These analyses (table not shown) did not exhibit significant differences between the two groups. For example, on the relationship between encounters and experience quality for the strongly and weakly motivated solitude/privacy groups, the *mean* coefficients were −0.16 and −0.20, respectively, and the *t-test* indicated that they were not significantly different than one another.

Discussion

The primary objective of our research was to understand the effect of encounters on experience quality using a new method. The ability to factor-out inter-subject variation and describe both the consistency and magnitude of relationships allowed us to improve understanding of the nature of the

Copyright © 2001 All Rights Reserved

relationship. Earlier studies were able to conclude only that the relationship between density and experience quality was weak, meaning *r-square* values were small. We were able to conclude that, for most sampled backpackers (% of sample in parentheses), increased encounters resulted in increased perceived crowding (80%), decreased solitude/privacy achieved (77%), and decreased experience quality (60%). We also found that the magnitude of the effect of number of encounters on perceived crowding and solitude/privacy achieved was substantial.

However, although the experience of most sampled backpackers was adversely affected by high numbers of encounters, feeling crowded, and not achieving a sense of solitude/privacy, experience quality remains high and, in general, was only slightly affected by encounters with other groups. We also found that even when the analysis is confined to backpackers whose experience is adversely affected by encounters and crowding, the magnitude of effect on experience quality is small.

We recognize that there are some visitors whose experience is highly affected by encounters and crowding. However, our data suggest that this clientele is very small. Using the admittedly arbitrary standard of a slope steeper than +/− 1.0 for relationships between independent variables and experience quality, only 2-6% of our sample were strongly affected by either encounters, perceived crowding, or solitude/privacy achieved. Neither visitors who chose to visit low-use portions of Grand Canyon nor those who were highly motivated to find solitude/privacy were unusually sensitive to increased encounters and crowding.

Implications for Use Limits

A secondary objective was to re-visit the implications of the effects of encounters for decisions about use limits. A common explanation for the small effect of encounters and crowding on experience quality is that experience quality is multi-dimensional (Manning, 1999) and therefore "we would expect the effect of crowding alone to be small" (Shelby & Heberlein, 1986, p. 60). These authors argue that even if there are small adverse effects, we should still try to correct the cause of the effect. This argument would be appropriate if there were not trade-offs involved. It fails, however, if the solution to the problem is worse than the problem itself.

We agree that the concept of multiple sources of satisfaction is a forceful explanation of the weak relationship between density and quality. However, we believe that this weak relationship is a highly significant finding because it indicates that there is little empirical justification for limiting use. Given the benefits that accrue to recreationists from such activities as exercising, exploring, viewing scenery, and socializing with other group members, it is not surprising that they have high quality experiences even if they meet more people or feel more crowded than they prefer. This does not mean that feeling crowded is unimportant and that limiting use is inappropriate. However, it suggests that managers should be cautious about implementing pro-

Copyright © 2001 All Rights Reserved

grams that require visitors to forego all the benefits of a recreation engagement (by denying them access) in order to provide the relatively small net increase in experience quality that most visitors accrue when given the opportunity for a low-density experience.

Twenty-five years ago, Wagar (1974) observed that problems with empirically-derived use limits were due to studies of visitors to specific areas rather than to a whole system of areas. For any single area, he argued, it is impossible to conclude that limiting use will produce more aggregate benefits than allowing mass use. This follows from the fact that increases in experience quality associated with reduced use cannot possibly compensate for the reduction in quantity of recreation associated with decreased access. We believe that most backcountry visitors intuitively understand this, and when given the choice, will optimize the trade-off between access and experience quality in favor of access. This would explain the common finding that while most visitors support the concept of use limits, few visitors support the actual imposition of use limits, once they know that their freedom of access will be reduced (e.g., Cole, Watson, Hall, & Spildie, 1997). Wagar (1974) argued that the strongest justification for use limits could be made when they enhance the total experience quality provided by a system of lands. If most of our public lands allow high-density use, limiting use on some tracts of land would produce more aggregate benefits to experience quality than allowing high-density use of all lands. In other words, we should look to the regional context of recreational opportunities for justification of use limits, not the preference of current on-site users (cf. Manning, 1985).

Unfortunately, Wagar's advice has seldom been heeded and early criticism of the thrust of most carrying capacity research has been ignored. The results of numerous empirical studies over the past decades have contributed to knowledge about such issues as visitors' unconstrained preferences or acceptability judgments regarding encounter levels. However, unconstrained evaluations have little utility within decision-making contexts characterized by meaningful trade-offs. Consequently, such studies have not substantially improved the empirical basis for making management judgments about use limits. In some cases, authors of empirical studies have been careful to state that carrying capacity decisions are fundamentally value judgments and that current recreation users are just one of "a number of potential sources for evaluative judgments" (Shelby, Vaske, & Donnelly, 1996, p. 104). Less careful interpretations have led to accusations that scientists have ignored empirical data and excluded the values of certain clienteles (Becker, Jubenville, & Burnett, 1984) in an attempt to protect the values of more "personally compatible social strata" (Burch, 1981, p. 224).

Our results neither support nor invalidate the use restrictions currently in place at Grand Canyon. The findings suggest that most people who obtain a permit have a slightly higher quality of experience as a result of the use limits. However, such results are incapable of suggesting whether use limits at Grand Canyon are in the best interests of society at-large, the visitors

Copyright © 2001 All Rights Reserved

unable to obtain a permit, or even those who obtained a permit this time but will be unsuccessful in the future. Limits can only be supported to the extent that the park planning process legitimized value judgments that, at Grand Canyon, provision of a low-density experience is worth the costs of denying access.

Conclusion

Using a new research design, we were able to show more clearly than in earlier studies that increased encounters adversely, yet weakly, affects the experience quality of a majority of Grand Canyon backcountry visitors. We conclude that there may be important justifications for use limits in backcountry areas but the popular empirical paradigms do not contribute to a better understanding of the trade-offs inherent in decisions about restricting access. Researchers should give renewed attention to the framework discussed by Wagar in his seminal work on carrying capacity, which stresses the importance of employing regional perspectives within a context that recognizes meaningful trade-offs of use limitations.

References

Becker, R., Jubenville, A., & Burnett, G. (1984) Fact and judgment in the search for social carrying capacity. *Leisure Sciences, 6,* 475-486

Bishop, D., & Witt, P. (1970) Sources of behavioral variance during leisure time. *Journal of Personality and Social Psychology, 16,* 352-360

Burch, W. (1981). The ecology of metaphor—spacing regularities for humans and other primates in urban an wildland habitats. *Leisure Sciences, 4,* 213-231.

Burch, W. (1984). Much ado about nothing—some reflections on the wider and wilder implications of social carrying capacity *Leisure Sciences, 6,* 487-496

Cole, D., Watson, A., Hall, T., & Spildie, D. (1997) High-use destinations in wilderness. Social and biophysical impacts, visitor responses, and management options Research Paper INT-RP-496. Ogden, UT: USDA Forest Service, Intermountain Research Station.

DePaulo, B., Kashy, D., Kirkendol, S., Wyer, M., & Epstein, J (1996) Lying in everyday life. *Journal of Personality and Social Psychology, 70,* 487-496.

Ditton, R., Graefe, A., & Fedler, A. (1981). Recreational satisfaction at Buffalo National River. Some measure concerns. Some Recent Products of River Recreation Research (pp. 9-17). General Technical Report NC-63 USDA Forest Service, North Central Experiment Station.

Driver, B., Tinsley, H., & Manfredo, M. (1991) The paragraphs about leisure and recreation experience preference scales Results from two inventories designed to assess the breadth of the perceived psychological benefits of leisure. In B Driver, P. Brown, & G Peterson, (Eds.) *Benefits of Leisure* (pp 263-286). State College, PA: Venture Publishing.

Hall, T. & Shelby, B (1996) Who cares about encounters? Differences between those with and without norms. *Leisure Sciences, 18,* 7-22.

Hammitt, W. & Rutlin, W. (1995). Use encounter standards and curves for achieved privacy in wilderness. *Leisure Sciences, 17,* 245-262

Heberlein, T. (1977). Density crowding, and satisfaction. Proceedings. River recreation management and research symposium (pp. 67-76). General Technical Report NC-28. USDA Forest Service, North Central Experiment Station.

Copyright © 2001 All Rights Reserved

Herrick, T. & McDonald, C. (1992). Factors affecting overall satisfaction with a river recreation experience. *Environmental Management, 16,* 243-247

Kenny, D., Kashy, D., & Bolger, N. (1997). Data analysis in social psychology. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.) *Handbook of Social Psychology. Fourth Edition* (pp. 233-265). New York, NY: McGraw-Hill

Kenny, D. (1987). *Statistics for the Social and Behavioral Sciences.* Boston, MA: Little, Brown, & Co.

Kuss, F., Graefe, A., & Vaske, J. (1990) *Visitor Impact Management. A review of research.* Washington, D.C.. National Parks and Conservation Association.

Lee, R. (1977). Alone with others: The paradox of privacy in wilderness. *Leisure Sciences, 1,* 3-19.

Lucas, R. (1980). Use patterns and visitor characteristics, attitudes, and preferences in nine wilderness and other roadless areas Research Paper INT-253 Ogden, UT USDA Forest Service, Intermountain Research Station

Manning, R (1985). Diversity in democracy. Expanding the recreation opportunity spectrum. *Leisure Sciences, 7,* 377-399

Manning, R. (1999). *Studies in Outdoor Recreation Search and Research for Satisfaction, Second Edition.* Corvallis, OR. Oregon State University Press

Manning, R., Lime, D., Freimund, W., & Pitt, D. (1996). Crowding norms at frontcountry sites: A visual approach to setting standards of quality. *Leisure Sciences, 18,* 39-59.

Schomaker, J & Knopf, R. (1982) Generalizability of a measure of visitor satisfaction with outdoor recreation. *Applied Psychological Measurement, 6,* 173-183

Shelby, B. (1980). Crowding models for backcountry recreation. *Land Economics, 56,* 43-55.

Shelby, B , & Heberlein, T (1986) *Carrying Capacity in Recreation Settings.* Corvallis, OR: Oregon State University Press.

Shelby, B , Vaske, J., & Heberlein, T (1989) Comparative analysis of crowding in multiple locations: Results from fifteen years of research *Leisure Sciences, 11,* 269-291.

Shelby, B., Vaske, J., & Donnelly, M (1996) Norms, standards, and natural resources. *Leisure Sciences, 18,* 103-123.

Stankey, G (1973). Visitor perception of wilderness recreation carrying capacity. Research Paper INT-142. Ogden, UT USDA Forest Service, Intermountain Research Station.

Stewart, W. & Cole, D. (1999) In search of situational effects in outdoor recreation: Different methods, different results. *Leisure Sciences, 21,* 269-286.

Wagar, A. (1964). The carrying capacity of wild lands for recreation. Forest Science Monograph 7. Washington, D.C.: Society of American Foresters.

Wagar, A. (1974). Recreational carrying capacity reconsider. *Journal of Forestry, 72,* 274-278.

West, P. (1981). Perceived crowding and attitudes toward limiting use in backcountry recreation areas. *Leisure Sciences, 4,* 419-426

Williams, D. (1988). Great expectations and the limits of satisfaction. A review of recreation and consumer satisfaction research. Outdoor Recreation Benchmark: Proceedings of the National Outdoor Recreation Forum (p 422-438). General Technical Report SE-52. Asheville, NC: USDA Forest Service, Southeastern Experiment Station.

Williams, D., Roggenbuck, J , Patterson, M., & Watson, A (1992) The variability of user-based social impact standards for wilderness management. *Forest Science, 38,* 738-756.

Copyright © 2001 All Rights Reserved