

Social Carrying Capacity: An Integration and Synthesis of Twenty Years of Research

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Abstract This paper reviews research conducted over the past twenty years related to social carrying capacity. Pursuant to existing definitions, the scope of this review extends beyond most individual studies to include the broad range of variables which influence how people perceive quality in a recreation experience. Emphasis is placed on integrating this diverse literature within a conceptual framework which helps to explain the diversity and complexity inherent in visitors' experience evaluations. This framework builds upon a basic understanding of recreationists' motivations and identifies an interrelated set of impacts resulting from increasing use levels. The paper then summarizes results of previous studies regarding: (1) relationships between the various impact parameters and recreational use levels, and (2) individual, activity, and site factors affecting use/impact relationships. Implementation of social carrying capacity is also examined, with emphasis on integrating scientific information and critical management judgments relative to the objectives of a given area.

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Introduction

Attempts to establish social carrying capacities for natural areas have intrigued, mystified, and burdened managers and researchers for at least the last twenty years. Wagar (1964, p. 3) defined carrying capacity as the "level of recreational use an area can withstand while providing a sustained quality of recreation." Implicit in this definition as well as other writings of the time was recognition of at least two components of carrying capacity—a quality environment and a quality recreation experience. Subsequent research has produced a large and diverse volume of literature, with environmental studies generally referred to under the rubric of biological or biophysical carrying capacity, and research related to the recreation experience labeled social carrying capacity.

More recently, some authors have questioned the validity of the carrying capacity concept for recreation (Bury, 1976; Burch, 1981; Washburne, 1982; Jubenville and Becker, 1983). Others have proposed guidelines for sorting out the complexities of applying carrying capacity (Brown, 1977; Hendee et al., 1978; Schreyer, 1976; Shelby and Heberlein, in press). Virtually all relevant recent articles suggest that carrying capacity is not an absolute value waiting to be discovered, but is rather a range of values which must be related to specific management objectives for a given area. A definition reflecting current thinking suggests that social carrying capacity is the "level of use beyond which experience parameters exceed acceptable levels specified by evaluative standards" (Shelby and Heberlein, in press).

The purpose of this paper is to review and synthesize what is currently known about social carrying capacity. Consistent with the above definitions, this task involves examination of the research related to the relationship between recreational use levels and perceptions of quality in the recreation experience. The paper begins with a discussion of conceptual underpinnings and

then summarizes pertinent empirical findings and management implications.

Conceptual Framework for Carrying Capacity Research

Sorting out the range of variables which influence how people perceive a recreation experience requires an initial understanding of recreation participation and motivation. Motivations are generally defined in terms of the causes or why of behavior (Berkowitz, 1969; Cofer, 1972; Weiner, 1973). While studies have used a variety of approaches and terms to examine recreationists' motivations, two related concepts—expectancy and norms—are particularly relevant to social carrying capacity.

According to expectancy theory, people engage in recreation activities with the expectation that their action will lead to certain rewards (Vroom, 1964; Driver and Tocher, 1970). The specific expectations people have for a given experience are influenced by individual and environmental factors such as the amount and type of previous experience, the degree of communication with others, situational variables and personality characteristics (Lawler, 1973; Schreyer and Roggenbuck, 1978). Research related to expectancy theory yields several important conclusions for the examination of social carrying capacity. First, most people participate in recreation activities to satisfy multiple expectations (Driver and Tocher, 1970; Hendee, 1974). The range of expectations considered has extended from the basic dichotomy of intrinsic versus extrinsic motivation (Iso-Ahola, 1980) to extensive lists of psychological outcomes or needs (Tinsley and Kass, 1978; Driver and Brown, 1978). Second, because the essence of recreation is choice, the motivations for participation in a given activity may vary considerably. Certain expectations tend to be associated with particular activities, but considerable variation in expectations may be found among individuals engaged in the same activity or using the same environment, or even within a given individual at different times (Schreyer and Roggenbuck, 1978; Graefe et al., 1981).

Expectations influence the perception of a recreation experi-

ence at several levels of specificity. The general experience expectations described above typically include psychological constructs like stress release, autonomy, achievement, learning, etc. At a more specific level, recreationists may have expectations about particular aspects of their experience, such as the pristineness of the environment or the number of other visitors to the area.

Some studies have examined specific expectations from a normative perspective. Norms refer to standards for evaluating situations or people as good or bad, better or worse (Cancian, 1975). When these standards are shared by the members of a social group, the norm can be labeled a "social norm" (Black and Heberlein, 1976). Thus, social norms are shared behavioral expectations or prescriptions of what people think "should" happen in a given situation.

While norms are typically used to describe shared standards, individuals are also active in creating their own personal norms (Kluckhohn, 1951). "Personal norms . . . signify the self expectations for specific action in particular situations that are constructed by the individual" (Schwartz, 1977, pg. 227). In relation to carrying capacity, normative models have focused on assessing visitor perceptions of appropriate amounts of use (i.e., contact preference norms). Less attention has focused on individual and group norms for other aspects of a given experience (e.g., the behavior of visitors or the condition of the environment), although the same logic could apply.

The relevance of expectations and norms to social carrying capacity lies in their ability to explain visitor evaluations of quality recreation experiences. Most conceptual approaches interpret the mechanisms through which experience evaluations occur as a process in which expectations or norms provide a basis for comparing preferred situations to those actually encountered. "Discrepancy theory," for example, suggests that visitors compare the perceived outcomes they receive from an experience with the rewards they expected to receive (Peterson, 1974). Overall satisfaction in any situation results from the discrepancies that exist for each expected reward (Lawler, 1973; Schreyer and Roggenbuck, 1978). "Social interference" models

(Brehm, 1966; Proshansky et al., 1970) suggest that negative evaluations result when the presence of other individuals interferes with the recreationist's goals. "Stimulus overload" models assume that perceptions of crowding occur when the level of social interaction exceeds that desired by the individual (Baumgartner and Gundry, 1978; Gramann, 1982). All of these conceptual models converge on the notion that understanding quality in the recreation experience requires an initial understanding of the goals or types of experiences sought by visitors.

Identification of Social Impact Parameters

Social carrying capacity research has progressed from an initial emphasis on the effects of user numbers to investigations of the social, personal, and situational factors affecting density evaluations (Altman, 1975; Gramann, 1982). Studies show that there is no single predictable response of visitors to varying use levels. Rather, visitors are affected by a series of interrelated impacts which result from recreational use of natural areas (Figure 1). Recreational use leads most directly to tangible outcomes like contacts between visitors and impacts on the natural environment. These social and natural impacts in turn can lead to a variety of perceptual and behavioral responses by visitors.

Many investigations show a direct positive link between the number of users in an area and the rate of contacts between individuals (Shelby, 1976, 1980a; Blackwood, 1977; Heberlein and Vaske, 1977; Randall, 1977; McDonald and Hammitt, 1979; Bultena et al., 1981). The consequences of this increased interaction usually include increased perceptions of crowding and decreased visitor satisfaction (Bultena et al., 1981; Schreyer and Nielson, 1978; Womble and Studebaker, 1981; Hammitt et al., 1982; Shelby et al., in press).

The distinction between density and crowding has been advanced by several authors (Desor, 1972; Stokols, 1972; Lawrence, 1974; Altman, 1975; Rapoport, 1975; Stockdale, 1978). Density refers to the number of individuals in a particular setting. Crowding is the negative evaluation of a certain density—a value judgment which specifies that there are too many people.

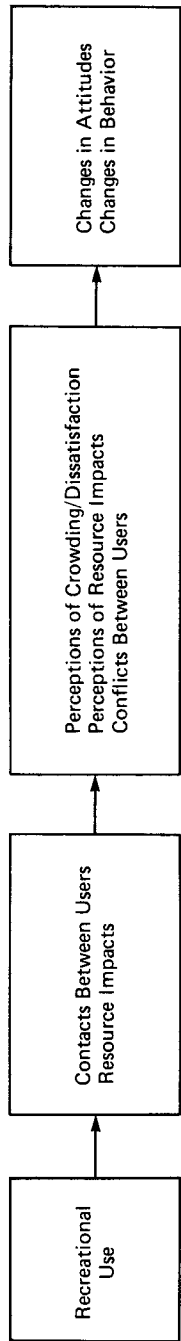


FIGURE 1. Interrelationships Between Social Impact Parameters.

Negative evaluations may occur when the presence of other recreationists in a setting interferes with goal achievement or creates a level of social stimulation which exceeds that desired by the individual (Baumgartner and Gundry, 1978; Gramann, 1982). Thus, whether or not an area is crowded is a subjective judgment of an individual, not an objective fact. Consequently, it will vary across individuals depending on a variety of social and psychological factors.

Although previous research has emphasized perceptions of crowding and user satisfaction, other impacts on the recreation experience have also been associated with use levels. Visitor experiences may be influenced more by the perception of human impacts on the environment, for example, than by the presence of large numbers of other visitors (Stankey, 1973; Badger, 1975; Lee, 1975). Lucas (1979) suggests there are two aspects to impact perception: (1) the perceived importance of impact conditions relative to other aspects of the setting, and (2) the evaluation of a given condition as desirable or undesirable. Simple recognition of an impact condition might be added as a third component which is prerequisite to the evaluation of importance and desirability. Resource impacts may be recognized or unrecognized by the visitor (Cole and Benedict, 1983). If recognized, the effects may be minimal if the condition is not regarded as undesirable. Even if an undesirable impact is noted, it may have little effect on visitor perception or enjoyment if the condition is unimportant to the recreationist.

Previous studies suggest that individuals are more sensitive to clear evidence of other humans (e.g., litter) than to other perhaps more serious impacts on site conditions such as eroded, rutted trails (Stankey, 1973; Frissell and Duncan, 1965). Lowenthal (1962) indicates that landscape perceptions are influenced by individual beliefs about the origin of the condition observed. Thus, visitors may respond to a resource disturbance more negatively if they attribute the cause to be human intervention as opposed to natural processes. On the other hand, visitor perceptions may also be related to their own style of use. The impacts associated with livestock use or motorized vehicles, for exam-

ple, may be more acceptable to horsemen and cyclists than to hikers (Lucas, 1979).

The potential for conflicts between users also increases with increasing use levels. Conflict represents a special case of user dissatisfaction where the recreationist attributes the source of goal interference to the behavior of other individuals (Jacob and Schreyer, 1980, pg. 369). This view of conflict is consistent with both discrepancy theory and social interference models; when discrepancies exist between desired goals and actual outcomes, overall satisfaction declines. The extent of conflict varies according to the importance of the goal being obstructed. Most previous discussions of conflict have focused on asymmetrical relationships between different activity groups, particularly between participants using motorized or non-motorized equipment (Lime, 1975; Adelman et al., 1982). Conflicts within activities can also result when recreationists with different behavioral standards (i.e., norms) interact with each other. The extent of conflict is influenced by the degree to which various user groups perceive each other as dissimilar.

Perceptions of crowding, human impacts, and conflict, however, may not always occur because visitors' responses to a given situation depend on their individual expectations and norms. In addition, people use various coping strategies to reduce or eliminate the potential negative effects of visitor densities. Several studies suggest, for example, that individuals may modify their expectations and preferences as a means of reducing the negative effects of perceived crowding (Altman, 1975; Schmidt and Keating, 1979; Gramann, 1982; Ditton et al., 1983; Shelby et al., in press). When visitors modify their normative standards to compensate for increasing use levels, the end result is a change in the character of the recreation experience to be found at a given area. Thus, current visitors of a heavily used area may be as satisfied as visitors 5 or 10 years ago when use levels were much lower, but they are receiving a different type of experience.

Recreationists may also change their behavior patterns to compensate for rising density levels. A shift in behavior patterns in response to changes occurring in the "environment" has been

called recreational displacement (Nielsen and Endo, 1977; Schreyer, 1979; Becker, 1981a; Anderson, D., 1981). Schreyer (1979) suggests that this change in behavior results when the individual (1) perceives that the desired outcomes of an experience are not attained, and (2) does not wish to reemphasize other aspects of that experience. Behavioral changes may involve simply revising the pattern of participation within a given resource (Schreyer, 1979). Some individuals, for example, may alter their frequency of participation or may choose to visit when the probability of lower density levels is greatest. People who are most sensitive to user densities may stop visiting a resource entirely when other behavioral or attitudinal adjustments fail to bring about the desired experience. These displaced recreationists may seek out a substitutable setting and be replaced with visitors who are more tolerant of rising use levels.

Relationships between Amount of Use and Impact Parameters

The premise that increasing visitor densities must lead to reduction in the quality of the visitor experience has stimulated numerous studies focusing on the relationship between use levels and various impact parameters. Most of these investigations have attempted to predict either visitor satisfaction or perceived crowding from user density. Subsequent work has focused on user perceptions of resource impacts and the behavioral adjustments of visitors in response to environmental changes or perceived crowding.

Satisfaction Models

Researchers and managers have consistently argued that the "goal of recreation management is to maximize user satisfaction" (Lucas and Stankey, 1974). Despite this verbal agreement, existing research has generally failed to document the empirical relationships between use levels and visitor satisfaction which are necessary for the development of evaluative standards and the delineation of a capacity limit (Table 1).

Table 1
Effects of Density and Contact Measures on Perceived Crowding and Satisfaction

Independent Variable	Dependent Variable		Citation	Resource	Activity
	Satisfaction	Perceived Crowding			
Hypothetical Density	—	NR	Wagar, 1964		Theoretical
	—	NR	Allredge, 1972		Theoretical
	—	NR	Fisher and Krutilla, 1972		Theoretical
	-.05	NR	Cicchetti and Smith, 1973	Spanish Peaks	Backcountry users
	—	NR	Stankey, 1973	BWCA	Canoers
	—	NR	Manning and Ciali, 1980	4 Vermont Rivers	River users
	NR	.18*	Lee, 1975	Yosemite	Backcountry users
	.00	.05	Shelby, 1976, 1980a	Grand Canyon	Rafters
Actual Density	-.06	.32*	Heberlein and Vaske, 1977	Brule River	Canoers
	.00	.23*			Tubers
	.11	.06*			Fishermen
	0	NR	McConnell, 1977	6 Beaches in Rhode Island	Singles beach
	—	NR			Natural area beach
	.09	.29*	Randall, 1977	Sleeping Bear Dunes	Day—visitors
	.17*	.01	Heberlein and Laybourne, 1978	Wisconsin	Deer hunters
	.01	.44*	Heberlein and Baumgartner, 1978	Grand River Marsh	Goose hunters—firing line
	.02	.07			Goose hunters—managed hunt
	NR	.26*	Absher, 1980	Yosemite	Backcountry users
	.00	.20*	Shelby and Colvin, 1979	Rogue River	Rafters
	NR	.06	Gramann and Burdge, 1981a	Lake Shelbyville	Reservoir users
NR	.26*	Absher and Lee, 1981	Yosemite	Backcountry users	
0	NR	Becker, 1981a	Upper Mississippi	River users	
0	NR	Becker, 1981a	Lower St. Croix	River users	
NR	NR	Bultena et al., 1981	Mt. McKinley	Hikers	

	.09*	Ditton et al., 1982	Buffalo River	Floaters
	.61*	Hammitt et al., 1982	Hiwassee River	Tubers
	.28*	Heberlein et al., 1982	Sandhill Management Area	Deer hunters
Actual Contacts	.05	Shelby, 1976, 1980a	Grand Canyon	Rafters
	.12*	Shelby and Colvin, 1979	Rogue River	Rafters
Reported Contacts	0	Blackwood, 1977	Wolf River	Rafters
	-.11*	Heberlein and Vaske, 1977	Brule River	Canoers
	-.15			Tubers
	.08			Fishermen
	0	Becker, 1981a	Lower St. Croix	River users
	-.10	Heberlein and Laybourne, 1978	Wisconsin	Deer hunters
	.06	Heberlein and Baumgartner, 1978	Grand River Marsh	Goose hunters—firing line
	.05			Goose hunters—managed hunt
	NR	Schreyer and Nielson, 1978	West Water Canyon	Floaters
	NR		Desolation Canyon	Floaters
	-.02	McDonald and Hammitt, 1979	Hiwassee River	Tubers
	.07		Deep Creek	Tubers
	.20*		Chattahoochee River	Rafters
	.69*		Rogue River	Rafters
	.30*	Shelby and Colvin, 1979	Great Gulf Wilderness	Hikers
	.10	Donnelly, 1980	4 Vermont Rivers	Fishermen
	.09	Manning and Ciali, 1980		Floaters
	.06		4 Vermont Rivers	Swimmers
	.08	Manning and Ciali, 180	Mt. McKinley	Hikers
	.01	Bultena et al., 1981	Dolly Sods Wilderness	Hikers
	-.02	Vaske et al., 1982a	Hiwassee River	Tubers
	NR	Hammitt et al., 1982	Dinosaur National Monument	Floaters
	NR	Schreyer, 1976	White Mt. National Forest	Hikers
	.00	Vaske and Graefe, 1983	Fishing Bay WMA	Goose hunters
	.18*	Vaske et al., 1983b	Tuckahoe State Park	Goose hunters
	.18			

(continued)

Table 1—continued

Independent Variable	Dependent Variable		Citation	Resource	Activity
	Satisfaction	Perceived Crowding			
Perceived Crowding	-.14*		Shelby, 1976, 1980a	Grand Canyon	Rafting
	-.10		Blackwood, 1977	Wolf River	Rafting
	-.14*		Heberlein and Vaske, 1977	Brule River	Canoers
	-.20*		Randall, 1977	Sleeping Bear Dunes	Day—visitors
	-.15*		Shelby and Colvin, 1979	Rogue River	Rafters
	-.01		Donnelly, 1980	Great Gulf Wilderness	Hikers
	-.05		Bultena et al., 1981	Mt. McKinley	Hikers
	-.12*		Ditton et al., 1982	Buffalo River	Floaters
	-.18*		Vaske et al., 1982a	Dolly Sods Wilderness	Hikers
	.01		Vaske and Graefe, 1983	White Mt. National Forest	Hikers
	-.18*		Vaske et al., 1983b	Fishing Bay WMA	Goose hunters
	-.20*			Tuckahoe State Park	Goose hunters

(-) minus sign equals negative correlation predicted or suggested by the research.

(0) zero equals no association.

(+) plus sign equals positive relationship.

NR = not reported.

Entries with decimal points refer to zero order correlations.

*p < .05.

Several economists (Alldredge, 1972; Fisher and Krutilla, 1972) have developed theoretical models for determining social carrying capacity. The model described by Alldredge (1972) assumes that enjoyment from a recreation experience is inversely, and solely, correlated with the number of people present. Accordingly, intrusions into an individual's solitude are hypothesized to reduce the quality of the recreation experience.

Some empirical research (Cicchetti and Smith, 1973; Stankey, 1973; Manning and Ciali, 1980) supports this model's premise that satisfaction declines as use levels increase. These studies, however, examined the effects of "hypothetical density" on users' perceptions of the experience (Table 1). That is, respondents were generally asked how they would respond to a variety of hypothetical density levels. Subsequent investigations which examined the bivariate correlation between actual density and satisfaction have failed to confirm the predicted negative relationship. Most of the pertinent articles presented in Table 1 found no relationship between actual density and satisfaction. Of the three investigations which did report a statistical effect, two showed a positive rather than a negative association (Heberlein and Laybourne, 1978; Heberlein et al., 1982). The activity under examination in both of these cases was deer hunting. As noted by the authors, "the presence of hunters outside of one's party is often considered an asset because they move deer and increase the chances of bagging for everyone" (Heberlein and Laybourne, 1978, pg. 41). McConnell's (1977) study also serves to highlight the complexities of understanding the satisfaction concept. Density had a negative effect in a natural area near a wildlife refuge where the desired experience was presumably interaction with the natural resource. Density had no effect, however, on a highly developed "singles" beach where the users probably wanted to see and meet other people.

Some researchers have examined various factors which may attenuate the correlation between density and satisfaction. For example, even though there may be many visitors in an area, the geographic characteristics of the resource may limit the amount of contact individuals have with one another. Studies examining this possibility have focused on the relationship between visitor

contacts and satisfaction (Table 1). Two types of contact measures can be identified. The first involves the effects of "actual contacts" on satisfaction. Shelby (1976) and Shelby and Colvin (1979) measured actual contacts by putting an observer on float trips in the Grand Canyon and the Rogue River, respectively. Neither of these studies showed a relationship between actual contacts and satisfaction.

Other investigators have examined the relationship between visitors' "reported contacts" and satisfaction. Although estimates of reported contacts may not be as accurate as those provided by trained observers (Shelby and Colvin, 1982), numerous studies suggest that it is the visitors' perceptions of the trip and not the researchers' which are the important determinants of quality recreation experiences (Iso-Ahola, 1980; Vaske et al., 1983a). The findings presented in Table 1 demonstrate that in most situations there is no significant relationship between reported contacts and satisfaction.

In general, the summary statistics presented in Table 1 fail to support the satisfaction model's primary hypothesis. Recreationists are just as satisfied on high-use days as they are on low-use days. Several plausible explanations for this situation have been suggested. One school of thought suggests that it is not surprising to find many people reporting high satisfaction with their leisure activities because they have freely chosen these activities to provide satisfaction (Heberlein and Shelby, 1977). Cheek and Burch (1976) suggest that because leisure is spontaneous and connotes a sense of freedom, some people may have no preconceived expectations to fulfill or their expectations may be fluid and adjustable. Schreyer (1979) elaborates on the psychological mechanisms that may yield reports of high satisfaction: (1) individuals may *shift their perceptions* of the experience away from original evaluations in order to maintain the desired experience; (2) individuals may *shift their priorities* of expectations to maintain satisfaction; or (3) individuals may *change their behavior* to achieve preferred outcomes that have not been attained during previous occasions.

All of these potential explanations are consistent with the conceptual framework described earlier. Satisfaction cannot be predicted from user density or contact variables because visitors'

multiple expectations may be affected in different ways by use levels and because changes in attitudes and/or behavior may cause satisfaction to remain high under varying levels of density.

Perceived Crowding Models

The traditional crowding model predicts that use levels influence the number of contacts between visitors, and contacts influence perceived crowding. A total of 13 studies were identified as presenting data on the relationships between actual density and perceived crowding (Column 2 of Table 1). Ten of these investigations reported a positive, significant effect. As use levels increased, recreationists were more likely to evaluate the experience as crowded. The magnitude of the observed correlations ranged from .01 to .61, with an average of .21. As in the case of the satisfaction concept, this suggests that the relationship between actual density and perceived crowding may be attenuated by geographic factors or by the individual's perceptions of the experience.

Two studies examined the effects of actual contacts on perceived crowding (Column 2, Table 1). Shelby (1976) found no significant zero order correlation for river runners in the Grand Canyon, while a similar study of Rogue River rafters indicated a significant relationship in the predicted direction (Shelby and Colvin, 1979). Only one percent of the variance in perceived crowding, however, was explained by the actual contact measure.

Research related to the effects of reported contacts on perceptions of crowding reveals stronger and more consistent levels of association. All of the studies identified in Table 1 which examined these two variables showed positive relationships, with an average correlation of .34. The same investigations, however, also document that crowding perceptions can be predicted more accurately when user contact variables are examined in combination with other measures like expectations, preferences, prior experience, and commitment to the activity. It seems reasonable to conclude that crowding perceptions are influenced by use densities, but this relationship is mediated by a variety of other situational and subjective variables.

Perceptions of Resource Impacts

Research on the perceptions of human impacts on the environment has generally been descriptive, with little attention given the relationships between use levels and impact perceptions. Several studies have shown that impact perceptions can be a determinant of visitor enjoyment and that visitors respond differently to various forms of impact (Stankey, 1973; Lee, 1975; Badger, 1975). Research conducted in wilderness areas, for example, indicates that trash and debris left by previous campers are the most frequent complaints by visitors (Frissell and Duncan, 1965; Stankey, 1973).

Recent investigations suggest that user perceptions of environmental disturbance and crowding may be interrelated (Bultena et al., 1981; Vaske et al., 1982a; Ditton et al., 1983). Vaske et al. (1982a), for example, found that the perception of environmental disturbance was the strongest predictor of perceived crowding in a wilderness area. Whatever the causal linkages, perceptions of both crowding and resource impacts apparently accompany increasing use levels and in turn influence evaluations of quality in recreation experiences.

Behavioral Adjustments

Most research has examined behavioral adjustments in terms of the relationship between visitor displacement and perceived crowding (Nielsen and Endo, 1977; Becker, 1981a; Vaske et al., 1980; Anderson, D., 1981). Nielsen and Endo (1977) sampled experienced river runners in the Grand Canyon to determine whether they sought rivers with lower density levels as a means of avoiding crowded environments. Results indicated that while some recreationists did move to less crowded resources, others moved to even higher-use rivers. D. Anderson (1981) further examined the relationship between experience levels and displacement. It was hypothesized that more experienced users would be more likely to be displaced than those less experienced. The results failed to support the predicted relationships. Beginners, moderately experienced users, and veterans were

equally likely to change from high-use entry points to moderate or low-use access areas. For all groups, factors identified as important to user displacement included litter, noise, worn-out campsites, large groups, motorboats, and other visitors at entry points.

Findings presented by other researchers, however, show that individuals may take certain steps to avoid environments where crowding conditions exceed their tolerances. Becker (1981a) interviewed floaters on the Upper Mississippi and Lower St. Croix rivers to identify their preferences for one of the two rivers. Those who had stopped visiting a particular river were asked to specify their reasons for not using the resource. Analyses indicated a shift in use from the St. Croix to the less heavily used Upper Mississippi due to perceived crowding. Ancillary tests indicated that some visitors altered their use patterns in terms of time of participation as well as the section of river used. Similar findings have been reported for canoeists on the Brule River (Heberlein and Vaske, 1977), boaters at the Apostle Islands (Vaske et al., 1980), and river runners in the Grand Canyon (Nielsen and Shelby, 1977).

Overall, research on the displacement hypothesis reveals a mixed pattern of findings. Some investigations (Becker, 1981a; Heberlein and Vaske, 1977; Nielsen and Shelby, 1977; Vaske et al., 1980) support the predicted behavioral changes, while other studies (Nielsen and Endo, 1977; Anderson, D., 1981) fail to demonstrate the hypothesized effect. Given the amount of empirical evidence, the idea of recreation displacement provides only a tentative explanation for the effects of user numbers on visitors' behavior.

Factors Affecting Use/Impact Relationships

The findings summarized above demonstrate that the various impacts of rising use levels on the recreation experience can be explained only partially, at best, as a function of use level. The following discussion elaborates on some of the factors which mediate use/impact relationships. The discussion centers on in-

dividual variation in tolerances to impacts and activity- and site-specific influences.

Variations in Tolerance to Impacts

Individuals vary in their response to increasing recreational use. Recognizing the diverse, multidimensional nature of desires found among recreationists, many researchers have differentiated users into more homogeneous subgroups. This differentiation is based on the assumption that it is impossible to satisfy all visitors with a single management strategy. Attempting to do so would only satisfy the "average" user (Shafer, 1969; Schreyer, 1976). To compensate for diversity that is masked by average user profiles, typologies have been developed to classify participants in different recreation activities as well as participants within a single activity.

Some studies have defined and compared groups of recreationists which are distinct from a management standpoint, such as day versus overnight users, or motorized versus non-motorized visitors. Such groups are usually recognized easily and often receive different treatment by management policies.

Other conceptual and empirical typologies result in groups which are not as readily recognizable, but knowledge of their existence provides greater understanding of the diversity present in the aggregate group of recreationists. Several investigations, for example, have compared experienced versus inexperienced visitors (Nielsen et al., 1977; Vaske et al., 1980), or categorized outdoor recreation participants according to their expectations or motives (Brown and Haas, 1980; Hautaluoma and Brown, 1978; Ditton et al., 1982). Other studies use more diverse sets of criteria to identify activity types. Bryan (1979), for example, proposed a conceptual typology which arranged recreationists along a continuum ranging from the beginner to the specialist. This specialization continuum included dimensions related to amount of participation, skill, equipment and setting preferences, social group considerations, and attitudes and values. Brickler (1969) suggested a multidimensional scheme

for classifying national park visitors as cursory, moderate, or enthusiasts. Multidimensional attitude scales have also been used to categorize wilderness users according to their degree of commitment to "wilderness purist values" (Hendee et al., 1968; Stankey, 1973). The Recreation Opportunity Spectrum (ROS) currently being implemented by the Forest Service and the Bureau of Land Management provides a classification including six categories defined in terms of a combination of activity, setting, and experience attributes (Driver and Brown, 1978).

Despite these efforts to understand diverse user types, summarizing the tolerances of recreationists to impacts is difficult. Different individuals apply different normative standards when evaluating the presence of others (Shelby and Heberlein, in press). Moreover, relatively few investigations have attempted to measure the specific tolerances of particular user groups to the various types of impacts. Those studies which have compared visitor types have not used a consistent classification scheme.

Research completed to date, however, does allow a few generalizations regarding the varying sensitivities of recreationists. Table 2 illustrates these basic findings and provides some representative citations. Many of the examples highlight the conflicts which exist between motorized and non-motorized user groups (Lucas, 1964; Adelman et al., 1982).

Non-mechanized users are generally more sensitive to the presence and behavior of others than are mechanized visitors (Jacob and Schreyer, 1980). Differences in tolerances are also apparent among individuals who participate in smaller groups (Lime, 1972; Stankey, 1973). Environmental perceptions may be influenced by when the recreationist first visited a particular area (Nielsen et al., 1977; Vaske et al., 1980), or by the frequency of visitation (Bryan, 1979; Graefe, 1981). Finally, some investigations (Hendee et al., 1968; Stankey, 1973) have noted that visitors' motivations for participation affect their sensitivity to contacts. Nature/solitude seekers are generally less tolerant than urbanists and thrill seekers (Schreyer and Roggenbuck, 1978; Absher and Lee, 1981).

Table 2
Synopsis of Sensitive Versus Tolerant User Groups
Reported in Previous Studies

Sensitive	Tolerant	Citation
Paddling canoeists	Motorboaters	Adelman et al., 1982 Lime, 1975, 1977 Lucas, 1964 Schreyer and Nielson, 1978 Shelby, 1980b Stankey, 1973
Hikers	Trailbikers	Lucas, 1964
Skiers	Snowmobiles	Knopp and Tyger, 1973
Non/off-road vehicle users	Off-road vehicle users	Noe et al., 1982
Fishermen	Other water-related sports	Driver and Bassett, 1975 Gramann and Burdge, 1981a Heberlein and Vaske, 1977 West, 1982a
Backpackers	Horsemen	Stankey, 1973
Wilderness users	Developed recreation area users	Shelby, 1981
Small groups	Larger groups	Lime, 1972 Pfister and Frenkel, 1974 Stankey, 1973
Frequent participants	Infrequent participants	Bryan, 1979 Graefe, 1981
Experienced visitors	Inexperienced visitors	Ditton et al., 1982 Hammitt et al., 1982 Heberlein and Dunwiddie, 1979 Nielsen et al., 1977 Vaske et al., 1980
Specialists	Generalists	Bryan, 1979 Graefe, 1981 Hammitt et al., 1982 Jacob and Schreyer, 1980
High status	Low status	Jacob and Schreyer, 1980 West, 1982b White and Schreyer, 1979

Table 2—continued

Sensitive	Tolerant	Citation
Wilderness purists	Urbanists	Hendee et al., 1968 Stankey, 1973
Nature/solitude seekers	Thrill seekers	Absher and Lee, 1981 Ditton et al., 1982 Brown and Haas, 1980 Nash, 1977 Schreyer and Roggenbuck, 1978

Activity Specific Influences

Given a basic tolerance level, the response of individuals to contacts with others may also vary according to the types of activities and behavior encountered. An individual may be quite tolerant of contacts with hikers and extremely intolerant of contacts with off-road vehicles. The extent to which one type of use impacts another depends upon the social and personal norms visitors use to evaluate the appropriateness of specific behaviors. Method of travel and group size are the most visible cues for determining the extent of perceived similarity between different user types.

Most previous relevant research has focused on asymmetrical confrontations between motorized and non-motorized activities (Jacob and Schreyer, 1980). Several studies conducted in the Boundary Waters Canoe Area (BWCA), for example, have documented the presence of a one-way conflict between paddling canoeists and motorboats (Lucas, 1964; Lime, 1975, 1977; Adelman et al., 1982). Paddling canoeists disliked motorized visitors, but the people using motor-powered craft were not bothered by the other group. Schreyer and Nielson (1978) found similar results among western river floaters. Asymmetrical antipathy has also been shown between hikers and trailbikers (Lucas, 1964), oar-powered and motor-powered whitewater rafters (Shelby, 1980b), cross-country skiers and snowmobilers (Knopp and Tyger, 1973), and backpackers and horsemen (Stankey, 1973).

Differences in responses have also been reported for encounters with groups of different sizes. Lime (1972) showed that although large parties constitute a relatively small proportion of the total use in the BWCA, most users felt that seeing large parties reduced the perceived quality of the experience. Data reported by Stankey (1973) and Pfister and Frenkel (1974) indicate that when given the choice of meeting one large party as opposed to ten small parties, most visitors prefer more numerous contacts with smaller groups. Given the importance of solitude as a goal of participation for many individuals (Driver and Cooksey, 1977; Driver and Knopf, 1977; Lee, 1977; Twight et al., 1981), the presence of large parties may violate a small group social norm. Moreover, because most users travel in small parties (Lime, 1972; Stankey, 1973, 1980), larger groups stand out as being conspicuously different.

Conflict results when individuals with contrasting standards of behavior (i.e., personal norms) interact (Jacob and Schreyer, 1980). Such differences in personal standards may exist among participants engaged in the same activity, as well as people participating in different activities. For example, studies examining conflicts between individuals engaged in backcountry camping suggest that most individuals prefer to camp away from others (Lucas, 1964; Stankey, 1973; Lee, 1975; Badger, 1975). A recent paper by Heberlein and Dunwiddie (1979), however, indicated that less experienced individuals tended to select campsites closer to other visitors, while those judged to be knowledgeable about camping chose locations further away from the nearest visible occupied site. Evidently, the experienced camper used a different set of behavioral standards to identify an appropriate site. The novice may not have been aware of this social norm and inadvertently became a source of conflict by violating the standard.

Other researchers have noted the conflicts which result when individuals who have specialized in a certain activity encounter recreationists participating in less intense activities. Several researchers (Driver and Bassett, 1975; Heberlein and Vaske, 1977; Gramann and Burdge, 1981a; West, 1982a), for example, have highlighted the conflicts which result when experienced fisher-

men interact with other water-related activities (e.g., canoeing, tubing, and water-skiing). Many of the individuals engaged in these latter activities were less committed to their leisure pursuit than the fishermen. Because of this difference in intensity of participation, different personal and social norms may have been used to define acceptable behaviors. Most fishermen interviewed in the above-mentioned studies objected primarily to the other users' inconsiderate behavior, such as yelling and shouting, rather than their numbers.

Such differences suggest that it is not enough to ask visitors how many contacts with recreationists they will tolerate. Rather, the answer depends on the types and perceived similarity of the visitor groups encountered.

Site-Specific Influences

Evaluations of recreation experiences are influenced by the characteristics of the environment and by users' perceptions of the particular setting. Geographical features of resources (e.g., winding rivers) often serve to reduce the number of contacts between visitors and thereby lessen the impact associated with rising use levels.

Visitors' reactions to contacts with others also vary depending on the location of the encounter. Seeing others at a trailhead or on the trail, for example, generally has less impact than encounters at the campsite (Hendee et al., 1968; Stankey, 1973; Badger, 1975). Stankey (1973) found contacts on the periphery of a wilderness were viewed less negatively than those occurring in the interior. Titre and Mills (1982) found that perceptions of crowding were strongly correlated with the length of time floaters on the Guadalupe River had to wait for other river craft to pass through the rapids. Because visitors expected to see others at trailheads and access points, contacts at these locations had minimal impacts. Once recreationists start their trip, however, different normative standards appear to be used to evaluate the appropriate level of encounters.

Exceptions to this general rule have also been noted. Ditton et

al. (1983) examined the effects of encounters at different locations by relating site-specific measures of reported contacts to a measure of perceived crowding. Results indicated that river runners were sensitive to the number of contacts at put-in and take-out points, but that campground encounters had relatively little impact.

The label assigned to a given area may also affect users' experience evaluations. Hendee et al. (1978) speculate that simply classifying an area as wilderness may give the resource a certain identity which appeals to visitors. Becker (1981b) suggests that designating rivers as wild and scenic may serve to increase recreational use levels on protected rivers. L. Anderson (1981) showed that environmental perceptions vary when individuals have knowledge of a scene's randomly assigned official designation. Higher ratings of scenic beauty were obtained for areas designated as "wilderness" or "national park," as opposed to "commercial timber stand" or "leased grazing land." Shelby (1981) found that encounter norms vary according to the definition of the area, with wilderness users being the least tolerant and undeveloped recreation area visitors the most tolerant.

It is apparent that different social and personal norms function to delineate behaviors which groups and individuals perceive as appropriate in various natural environments. Jacob and Schreyer (1980) note that in extreme cases, attempts are made to limit or prevent out-group access to a resource. This effect seems particularly probable when the violation of a norm is linked symbolically with violations of other norms which evoke stronger standards (Black and Heberlein, 1976). For example, a fisherman's evaluation of meeting a tuber may not be a reaction to the individual per se, but rather to what the tuber represents. If the fishermen have a history of use on a river, even a single encounter with a recreationist engaged in a new activity might be viewed as both an invasion of privacy and a potential source of harm to a pristine environment (Vaske, 1978). As the importance of a particular place increases, visitors become more sensitive to recreation impacts and less tolerant of uses which are perceived to impair the area's natural attributes.

Implementation of Carrying Capacity

An assumption inherent in this paper is that the implementation of social carrying capacity requires an understanding of how recreationists impact each other and the environment, and the factors related to the occurrence of these impacts. More than research and scientific information will be required, however, for successful implementation. Most researchers and managers agree that the determination of carrying capacity requires two separate elements (Hendee et al., 1978; Stankey, 1980; Shelby and Heberlein, in press). The first involves a description of the relationships between specific conditions of use (e.g., types of use, site factors, amount of use) and the impacts associated with these conditions. The second component refers to an evaluative dimension which incorporates value judgments about the acceptability of various impacts.

The descriptive component of carrying capacity is concerned with the observable characteristics of a recreation system. Two types of descriptive data are important: management parameters and impact parameters (Shelby and Heberlein, in press). Anything an agency can directly manipulate is a management parameter. When the number of visitors entering a park can be regulated and controlled, use level is a management parameter. Other examples of management parameters include type of use allowed and length of stay. Impact parameters describe what happens to visitors or the environment as a result of visitor use patterns and other management parameters (Shelby and Heberlein, in press). As discussed earlier, the frequency of encounters with others while on the trail or at the campsite, perceptions of crowding, and conflicts between visitors are examples of impact parameters.

In examining how the number, type, and distribution of people using a given area affect the condition of the environment and the recreation experience, the descriptive component identifies how the system works, but it does not indicate how it "should" be managed. The answer to this question lies in the second component of carrying capacity: evaluation. The evaluative compo-

ment considers the different objective states produced by management parameters in an effort to determine their relative merits (Shelby and Heberlein, in press). For successful implementation, it is important that this evaluation will result in a set of standards specifying the type of experience to be provided in a given area.

Shelby and Heberlein (in press) suggest that three conditions are necessary to establish social carrying capacity:

- 1) A known relationship between use level or other management parameters and experience parameters, 2) agreement among relevant groups about the type of recreation experience to be provided, and 3) agreement among the relevant groups about the appropriate levels of experience parameters.

While the first condition can theoretically be met through scientific data collection, existing studies demonstrate the difficulty in documenting the necessary use/impact relationships. Most of the existing evidence is concentrated on a few selected correlations rather than the complete range of potential use/impact relationships. In addition, most studies have examined relationships at only a general level (e.g., the effects of total number of contacts on either perceived crowding or overall satisfaction). This level of measurement fails to reflect the complex nature of the carrying capacity question. It is not enough to ask how many visitors one will tolerate. Studies must go further and ask the question in the context of the particular user groups, times, and places on which the answer depends.

All three of Shelby and Heberlein's required conditions depend to some extent on judgmental inputs for implementation. Relative to the first condition, this paper has shown that there are many potential impact or experience parameters which are influenced by a variety of management parameters. Management judgments can contribute to the achievement of this condition by narrowing the range of management/impact parameter relationships to be examined. The latter two conditions, requiring agreement on the definition of the experience to be provided, depend to an ever greater degree on critical management judgments

about the types of groups that are "relevant" and the experience parameters that should be emphasized. This paper has shown that visitor perceptions of a quality recreation experience vary considerably both within and between activities. Thus the definition of the type of experience to be provided in a given area in essence requires a decision favoring one user group over competing groups seeking different types of experiences. While resource managers may be reluctant to make such decisions explicitly, it is important to recognize that this judgment is inherent to the carrying capacity question and will occur by default if not deliberately introduced. Avoidance of a specific experience definition essentially allows those activities which can preempt other opportunities to determine the recreational character of the area (Schreyer, 1976). The question of the type of experience to be provided is often a difficult one. The decision, however, can be guided and defended by a variety of criteria including institutional or policy mandates, alternative opportunities available in the area, and user preferences.

Effective implementation is more likely if evaluative standards are set prior to empirical investigations. This is because the standards selected identify the parameters that need to be studied and the form in which they should be measured. Previous research has often documented relationships between use levels and crowding, for example, only to leave management with the difficult task of deciding how much crowding is too much. This approach has been problematic because evaluative standards either have not existed or were not expressed in terms of crowding; hence knowledge of the relationship between use level and crowding was of little value for implementing capacities.

Recent literature shows a trend toward the use of tangible, specific criteria in the wording of evaluative standards. Shelby and Heberlein (in press) suggest that standards be expressed for impact parameters like number of encounters with groups of a particular size or type, percent of nights camped away from others, or number of people encountered at attraction sites. For use in the Flathead Wild and Scenic River Management Plan, McLaughlin et al. (1982) suggested such standards as 80 percent

probability of encountering no more than two floater parties (or six shore parties) per day, and no more than an average of four occurrences of litter viewable from the watercraft per management unit. Standards of this nature are useful because the impact parameters involved are tangible, measurable qualities of a recreation experience and are most directly related to use level and other management parameters. Such statements also reflect the site- and activity-specific influences that have been shown to be important and are compatible with the measurement of visitors' experience norms. Perhaps most importantly, standards expressed in terms of tangible impact parameters provide a common denominator between the descriptive and evaluative aspects of carrying capacity implementation. With such standards in place, research can be designed to determine what use patterns and associated management actions are most likely to result in the desired conditions.

In recent years, most authors have argued that evaluative standards should be incorporated into clear and specific management objectives for a given area (Hendee et al., 1978; Heberlein, 1977; Brown, 1977). Hendee et al. (1978, pg. 80) point out that "a major shortcoming in most . . . management plans is the lack of objectives that allow managers to explicitly state the conditions they seek and to measure performance with regard to achieving these objectives." Heberlein (1977) further suggests that management objectives must go beyond such generalities as "protect the resource" and "provide satisfying experiences." To be effective, management objectives need to define the type of experience to be provided in terms of measurable statements of appropriate ecological and social conditions (Stankey, 1980).

Conclusion

In spite of the volume of research that has been conducted, social carrying capacity remains an elusive concept. Stankey (1980, pg. 6) stated that "significant conceptual and methodological problems remain," while Burch (1981, pg. 221) went further in suggesting that "the research methodology, theory and findings still remain at a primitive level." This paper has at-

tempted to provide a new perspective on social carrying capacity by integrating existing research into a conceptual framework that reflects the range of considerations inherent to the concept.

The perspective developed in this paper places all variables related to the evaluation of quality recreation experiences within the purview of social carrying capacity. This approach recognizes that there are several types of impacts that can result from increasing use levels and that these impacts are interrelated and influenced by a variety of factors. Thus, there is no single capacity inherent to any given area. There may be as many potential capacities as there are combinations of impact parameters and types of experiences to be offered.

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