Measuring Perceived Crowding for High-Density River Recreation: The Effects of Situational Conditions and Personal Factors

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The authors examined the interaction of 3 situational variables (activity type, location, and encounter type) on 3 predictors of perceived crowding (perceived, preferred, and tolerable encounter levels). A total of 310 kayakers and canoers and 356 rafters completed on-site and mail-back surveys regarding their trip on the Nantahala River in North Carolina during Summer 1994. A multiple regression analysis showed that preferred and perceived encounters were more effective predictors of perceived crowding than tolerable encounter levels, but the relative effect of these measures depended on the situational context. Respondents' ability to specify tolerable encounter levels depended on their level of specialization. Any attempt to establish use limits must carefully consider all the aspects of the river use situation and recognize that multiple capacities may be related to location, activity, and type of use to be encountered.

Keywords preferred encounters, perceived encounters, tolerable encounters, social carrying capacities, use specialization

For at least the past 20 years, user perceptions of crowding have provided one approach to determining social carrying capacities (Heberlein, 1977; Shelby & Heberlein, 1986; Tarrant & English, 1996). Yet, in the decade following Manning's (1985) and others' (e.g., Lucas, 1964; Stankey, 1973) claims that multiple carrying capacities exist within a single recreation site, few studies have documented the interactive effects of different situational conditions (e.g., use levels, location, type of encounter and activity) and personal factors (e.g., encounter preferences and encounter tolerance levels) on perceived crowding levels.

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(Manning, 1985; Stankey, 1973), for canoeists encountering motorboaters (Schreyer & Nielsen, 1978), for experienced users encountering inexperienced users (Ditton et al., 1983), and for specialists encountering generalists (Hammitt et al., 1984). One explanation for these differences is that perceptions of crowding increase when users encounter others who are perceived to have values or goals that conflict with their own (Gramman & Burdge, 1984; Jacob & Schreyer, 1980). According to Graefe et al. (1984), method of travel and group size are the two most visible signs for assessing the appropriateness of another group.

The influence of activity on recreational crowding has partly been demonstrated in the preceding paragraphs. For example, backcountry users and boaters are affected by crowding at different locations within the setting (campsites vs. trail; Ditton et al., 1983; Patterson & Hammitt, 1990); the effect of use levels (perceived or actual) on crowding varies across different activity groups such as canoers, innertubers, anglers, and hunters (Shelby & Heberlein, 1986). Furthermore, there is conflicting evidence concerning the relative effect of different predictors of crowding for different boating groups on a single river. Heberlein and Vaske (1977) suggested perceived encounters and preferences are equally good predictors of crowding (explaining 33% and 38% of crowding variance, respectively), but the relative influence of these two variables varied by activity (canoeing, innertubing, and angling). Other studies suggested that perceived encounters may be more effective predictors of crowding for nonspecialized activities, whereas preferences and tolerances for encounter levels may be better predictors of crowding for specialized activities (Hammitt et al., 1984; Shelby & Heberlein, 1986). Specialization refers to the developmental process by which an individual progresses from a general infrequent participant in an activity to a highly committed participant seeking specific settings and equipment (Bryan, 1977, 1979). Furthermore, some activities are considered less specialized (e.g., innertube floating) than others (e.g., kayaking). At lower levels of specialization, and for less specialized activities, participants lack well-defined expectations about crowding levels (Hammitt et al., 1984) and are, therefore, more likely to rely on situational conditions than internal (personal) factors in reporting river encounters.

Personal Factors and Perceived Crowding

At least two personal factors have been found to affect perceived crowding: preferred encounter and tolerable encounter levels. Previous studies have shown that variance in crowding can be substantially increased by measuring the extent to which users encountered more or less people than they preferred (Shelby & Heberlein, 1986). Preferred encounter levels, for example, have explained between 16% and 25% of crowding variance in river settings (Bultena, Field, Womble, & Albrecht, 1981; Shelby, 1980; Shelby & Heberlein, 1986).

An alternative approach has been to ask users to report the highest number of encounters they could tolerate before use levels become unacceptable (Patterson & Hammitt, 1990; Roggenbuck, Williams, Bange, & Dean, 1991; Shelby, Bregenzer, & Johnson, 1988). This approach has received much attention in the past few years and has direct implications for determining carrying capacities, but the use of tolerable encounter measures may be limited to low-use density settings where users are more specialized. Specifically, nonspecialized users are less likely to report tolerable encounter levels than specialized (Patterson & Hammitt, 1990; Roggenbuck et al., 1991; Shelby & Vaske, 1991; Whittaker & Shelby, 1988). In support of this hypothesis, Roggenbuck et al. (1991) found that rafters were almost twice as likely to specify tolerable encounter levels for a wilder-

between 3,000–5,000 boaters on a weekend day and 500–2,000 boaters on a weekday. The river is managed by the USDA Forest Service (Wayah District) and is comprised of mostly Class I and Class II rapids, with several short Class III sections. It provides a 10-mile float, which takes about 4 hr to complete. Two primary activity groups float the river: rafts and kayaks or canoes. In 1993, rafts comprised about 90% of total use on the Nantahala (approximately 153,000 visits) compared to 10% use (around 17,000 visits) by kayaks and canoes. Eighty percent of the total use occurs during the summer.

Sample

A stratified (by activity) random sampling procedure was used to select boaters during the 1994 summer season (Memorial Day to Labor Day). To ensure relatively equal sample sizes across activities, we targeted 600 kayakers and canoers and 900 rafters for data collection. Sampling was conducted by Forest Service volunteers at a site within 100 m of the take-out and between 10:00 a.m. and 6:00 p.m. on 25 weekdays and 13 weekends (including holidays). Boats were sampled by selecting the first available craft past a specified point on the river and then randomly choosing one boater from each selected craft.

Data Collection

An on-site survey was used (a) to obtain names and addresses of river users and compliance to participate in a mail-back survey; (b) to explore the potential for nonresponse bias by asking users to report (i) number of times floated the Nantahala in the previous 5 years, (ii) number of people in the group, and (iii) type of boat (canoe, kayak, or raft); and (c) to identify whether the boat was commercial or private.

Of the 1,513 boaters contacted on-site, 1,393 (92.1%) agreed to complete an off-site mail-back survey. One hundred and sixteen names and addresses were illegible and surveys could not be mailed, generating a total sample of 1,277 respondents. Administration of the mail-back survey followed a modified version of the Dillman (1978) procedure. An initial mailing, one postcard reminder, and a second mailing were sent at 2- to 3-week intervals, resulting in a 52.2% response rate (n = 666).

Variable Measurement

The mail-back survey included the same three questions asked on-site (past use on the Nantahala, group size, and type of boat); in addition, it requested information about the number of hours the boater had floated the river on that specific trip and perceived paddling skills. The mail-back survey also measured perceived encounter, preferred encounter, and tolerable encounter levels for combinations of (a) three different locations (on the river, at the put-in, and at the rapids) and (b) two types of encounters (with rafts or with kayaks and canoes), as well as perceived crowding levels for each of the three locations (on the river, at the put-in, at the final rapids).

A specialization index for Objective 2 was computed by summing the Z scores for three variables: number of times respondent had floated the Nantahala in previous 5 years, perceived paddling skills (on a scale of *beginner, intermediate, advanced,* or *expert*), and whether or not the respondent was a private or commercial boater. The specialization index was then divided into three relative categories (low, moderate, high) using percentiles; that is, respondents in the lowest 33% were classified as low specialization, whereas those in the highest 33% were classified as highly specialized. High specialized users were typically private boaters with greater levels of past experience and more advanced perceived paddling skills.

To measure perceived encounter levels, we asked respondents to indicate the total number of rafts and the total number of kayaks and canoes they encountered at each of the three separate locations. Preferred encounter levels were measured by asking boaters if they preferred use levels to be "much more" or "much less" (on a 5-point scale) than what was observed on their trip (this is similar to an approach used by Shelby et al., 1983). Tolerable encounter levels were measured using an approach adapted from Patterson and Hammitt (1990) and Roggenbuck et al. (1991): Respondents were asked either to indicate the maximum number of craft they could tolerate seeing before the quality of their recreation experience would be unacceptably reduced or, if they could not specify a number, to check whether "the number of craft matter but cannot specify a number" or "don't care, makes no difference." Perceived crowding was measured using Heberlein and Vaske's (1977) 9-point crowding scale (from 1 = *not at all crowded* to 9 = *extremely crowded*).

Analysis

All analysis was conducted using SPSS/PC+ Version 4.01 (Norusis, 1991), with a significance level of $p = .05$. Objective 1 was tested using the multiple regression procedure (stepwise method) with pairwise deletion of missing cases.[1] Objective 2 was tested with a chi-square. A two-way repeated measures multivariate analysis of variance (MANOVA) was used to test the interactive effect of location and activity type on perceived crowding (Objective 3).

Results

Nonresponse Bias

A nonresponse bias check did not reveal significant differences between on-site and mail-back respondents for level of past experience on the river ($t = .74$, $p > .05$) and number of people in the group ($t = .23$, $p > .05$). Furthermore, no differences were detected on these two variables by activity (i.e., rafters vs. kayakers and canoers), providing some evidence that mail-back respondents did not differ from the total sample on these measures. Fifty-three percent of mail-back respondents were rafters ($n = 356$) and 47% were kayakers or canoers ($n = 310$).

Descriptive Findings

Less than one-quarter (21.7%) of all boaters on the Nantahala were private users. Most rafters were commercial (96.8%), whereas kayakers and canoers were evenly split (56.7% commercial and 43.3% private). The majority of kayakers–canoers (54.6%) were classified as high specialized users (vs. 22.7% who were low), whereas only 13.6% of rafters were classified as highly specialized (vs. 59.8% of rafters who were low).

Table 1 shows differences between the two activity groups on past use of the Nantahala, perceived paddling skills, and trip characteristics. Compared to kayakers and canoers, rafters were more likely to rate themselves as beginners or intermediate users and had significantly lower levels of past experience. Rafters also had significantly more people in their group and spent less time floating the river.

[1]Pairwise deletion of cases was used because of the relatively high number of respondents (62% of rafters and 60% of kayakers–canoers) who could not specify a tolerance level for encounters.

Table 1
Differences between rafters and kayakers–canoers on trip and user characteristics

Characteristic	Rafters			Kayakers and Canoers				
	M	*SD*	%	*M*	*SD*	%	t	χ^2
Number of times floated river	1.81	3.52		5.89	12.68		5.71[a]	
Number of people in group	13.94	15.97		7.87	13.56		5.21[a]	
Number of hours on the river	3.37	1.94		4.17	2.45		5.15[a]	
Perceived paddling skills								
Beginner			34.9			17.0		36.52[a]
Intermediate			47.5			49.7		
Advanced			14.8			26.8		
Expert			2.8			6.5		

[a] $p < .001$.

Table 2 shows mean scores on preferred encounter, perceived encounter, and tolerable encounter levels by location and encounter type for rafters and kayakers and canoers. Overall, preferences were generally greater for "same-activity" encounters; that is, kayakers and canoers preferred significantly fewer encounters with rafts across all three locations than did rafters, whereas rafters preferred significantly less encounters with kayaks and canoes than did kayakers and canoers. This finding occurred across all locations except the rapids, where there was no difference between the two activity groups in their preference for encounters with kayaks and canoes. Both groups were more concerned about boating levels at the rapids than at other locations. Kayakers and canoers indicated they would prefer, on average, slightly *more* (vs. less) encounters with other kayakers and canoers. Both groups reported more negative scores (indicating lower preference) for encounters with rafts than with kayaks and canoes.

Across all three locations and for both types of encounters (with kayaks and canoes or with rafts), kayakers and canoers reported significantly higher encounter levels than did rafters. One reason for this is the longer time spent paddling by kayakers and canoers (M = 4.17 hr) than rafters (M = 3.37 hr). Higher encounters with rafts are also expected given the higher proportion of rafters than kayaks and canoes on the Nantahala. More rafts were encountered at the put-in than at the rapids, but more kayaks and canoes were encountered at the rapids than at the put-in. Again, this is not surprising, because many kayakers–canoers run the rapids section multiple times.

Kayakers and canoers also reported significantly greater tolerance levels for encounters with other kayakers–canoers across all three locations as well as for encounters with rafts on the river. There were no differences between the two activity groups for encounters with rafts at the put-in or rapids. For both groups, tolerance levels were greater for encounters on the river and lowest at the rapids. Only 93 to 152 respondents were able to specify tolerance norms across the three locations and two types of encounters. (In contrast, more than 80% of respondents were able to specify a perceived number of encounters.)

Table 2

Differences in mean scores between rafters and kayakers–canoers on preferred, perceived, and tolerable encounters and perceived crowding by location and type of group encountered

Characteristic	Rafters		Kayakers–Canoers			
	M	*SD*	*M*	*SD*	*t*	*p*
Preferred encounters with rafts[a]						
On the river	−.50	.86	−.94	.84	6.55	<.001
At the put-in	−.54	.86	−.75	.85	3.15	.002
At the rapids	−.57	.85	−.96	.88	5.77	<.001
Preferred encounters with kayaks and canoes[a]						
On the river	−.19	.78	.03	.79	3.41	.001
At the put-in	−.15	.72	.05	.70	3.45	.001
At the rapids	−.28	.83	−.20	.86	1.11	.266
Perceived encounters with rafts[b]						
On the river	46.55	56.10	70.40	72.86	4.27	<.001
At the put-in	15.91	17.15	22.14	30.55	2.98	.004
At the rapids	13.37	14.31	19.30	16.71	4.48	<.001
Perceived encounters with kayaks and canoes[b]						
On the river	19.33	20.60	32.47	30.48	5.95	<.001
At the put-in	4.19	5.72	10.87	11.82	8.47	<.001
At the rapids	6.56	8.57	11.42	12.43	5.37	<.001
Tolerable encounters with rafts[b]						
On the river	28.42	21.51	37.38	36.84	2.11	.036
At the put-in	12.30	12.08	14.07	18.05	0.95	.345
At the rapids	9.31	8.24	10.34	10.82	0.91	.364
Tolerable encounters with kayaks and canoes[b]						
On the river	18.38	13.08	39.88	39.31	4.99	<.001
At the put-in	9.18	6.66	15.52	17.61	3.45	.001
At the rapids	6.85	5.86	12.10	17.18	3.08	.002
Perceived crowding[c]						
On the river	5.51	2.48	6.27	2.12	4.24	<.001
At the put-in	5.17	2.62	5.31	2.48	0.67	.505
At the rapids	4.98	5.84	5.84	2.28	4.58	<.001

[a]Scores ranged from −2 (*prefer much less*) to 2 (*prefer much more*).
[b]Respondents were asked to specify a number.
[c]Scores ranged from 1 (*not at all crowded*) to 9 (*extremely crowded*).

Objective 1

The effect of preferred, perceived, and tolerable encounter levels on perceived crowding is shown in Figure 1. The 12 beta weights for each relationship correspond to the combinations of location (on the river, put-in, and rapids), activity (rafters vs. kayakers and canoers), and type of group encountered (raft or kayak and canoe). Overall, preferred and perceived encounter levels explained substantially more of the variance in crowding than tolerable encounter levels. However, the relative importance of these independent variables on crowding appears to be influenced by the situational condition. For example, preferred and perceived encounter levels explained very little crowding variance (r^2 = .04 to .12) for encounters with kayaks and canoes but were more effective predictors of crowding when rafts were encountered (r^2 = .23 to .34). Moreover, the amount of crowding variance explained by the three independent variables together is higher at the rapids than at other locations (regardless of the activity or the type of group encountered).

For rafters, crowding is influenced more by preferred encounter levels than either perceived or tolerable encounters. When encountering other rafts, betas for preferred encounter levels ranged from –.37 to –.41, whereas perceived encounters ranged from .20 to .34. When encountering kayaks and canoes, betas for preferred encounter levels ranged from –.22 to –.30, and perceived encounters ranged from .10 to .19.

For kayakers and canoers, the relative effect of preferred versus perceived encounters on crowding levels was determined primarily by the type of group encountered. When encountering rafts, crowding was affected slightly more by preferred encounters (–.30 to –.41) than perceived encounters (.25 to .36) but, when encountering other kayaks and canoes, crowding was influenced more by perceived encounters (.20 to .24) than preference levels (–.12 to –.15).

Across location, encounter type, and activity, correlations among the independent variables ranged from –.12 to –.28 (for preferred and perceived encounters), .10 to .30 (for preferred and tolerable encounters), and .20 to .50 (for perceived and tolerable encounters). Results raise the concern of multicollinearity, especially between perceived and tolerable encounter levels (see *Study Limitations*).

Objective 2

Table 3 shows the percentage of respondents who (a) could specify a tolerable number of encounters, (b) were concerned about the number of encounters but could not specify a number, or (c) did not care about the number of encounters, by (i) location, (ii) encounter type, and (iii) level of specialization. Results of the chi-square show significant differences for encounters with kayaks and canoes only (across all three locations). Specifically, as specialization increases, the proportion of boaters who "don't care" about the number of encounters with other kayakers and canoers increases, and the proportion who report that "it matters, but cannot specify a number" decreases. Overall, more boaters were able to specify tolerable encounter levels for the rapids (ranging from 32.6% to 52%) than for the river (29.7% to 35.6%) and the put-in (30.7% to 49.3%).

Objective 3

A significant location by activity interaction (F = 12.60; $p < .001$) was found. Table 2 shows that kayakers and canoers felt significantly more crowded than rafters on the river and at

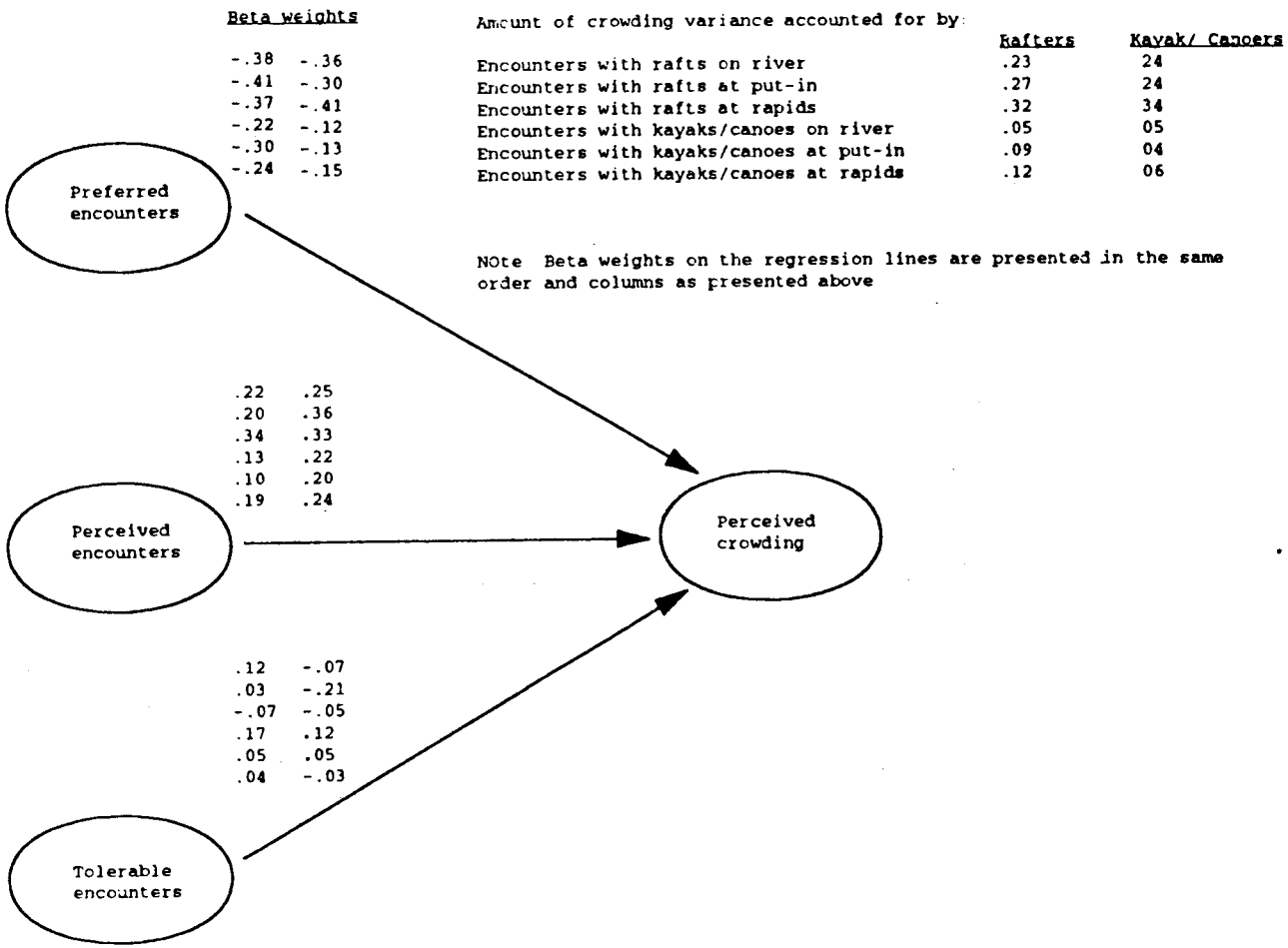

Figure 1. Effect of preferred, tolerable, and perceived encounter levels on perceived crowding by location, activity, and type of group encountered.

Table 3
Percentage of responses to the "tolerable encounters" question by location, type of group encountered, and level of specialization

Encounter	Level of Specialization (%)				
	Low	Moderate	High	χ	p
With rafts on the river				1.13	.889
It matters but could not specify a number	54.1	56.9	54.8		
Don't care–makes no difference	12.3	11.5	9.6		
Specified a number	33.6	31.5	35.6		
With rafts at the put-in				2.25	.689
It matters but could not specify a number	38.9	45.4	42.6		
Don't care–makes no difference	11.8	12.3	13.6		
Specified a number	49.3	42.3	43.8		
With rafts at the rapids				2.46	.651
It matters but could not specify a number	39.8	44.3	35.6		
Don't care–makes no difference	10.9	10.7	12.4		
Specified a number	49.3	45.0	52.0		
With kayaks–canoes on the river				27.11	<.001
It matters but could not specify a number	50.9	43.0	31.4		
Don't care–makes no difference	16.8	25.0	38.9		
Specified a number	32.3	32.0	29.7		
With kayaks–canoes at the put-in				21.96	<.001
It matters but could not specify a number	42.7	42.5	26.3		
Don't care–makes no difference	19.5	26.8	38.3		
Specified a number	37.7	30.7	35.4		
With kayaks–canoes at the rapids				25.36	<.001
It matters but could not specify a number	42.3	45.0	27.4		
Don't care–makes no difference	15.9	22.5	35.4		
Specified a number	41.8	32.6	37.1		

the rapids, but there was no difference between the two groups at the put-in. For both groups, crowding was highest on the river; however, rafters reported the lowest crowding at the rapids, and kayakers and canoers were less crowded at the put-in than at the rapids.

Discussion and Implications

Situational and personal factors interact to influence perceived crowding; that is, the effect of perceived, preferred, and tolerable encounter levels in predicting crowding depends on the location of the encounter, type of encounter, and activity. Furthermore, there is support for suggestions by Lucas (1964), Manning (1985), and Stankey (1973) that multiple carrying capacities exist within a single recreation setting. Before discussing implications of the findings, a brief summary of the results and a review of the study's limitations are provided.

Summary of Findings

Results of the study may be summarized as follows: (a) the three independent measures explained only limited crowding variance for encounters with kayakers and canoers (4–12%) versus encounters with rafts (23–34%); (b) the three independent measures explained more crowding variance at rapids than at other locations; (c) tolerable encounter levels were relatively poor predictors of perceived crowding; accounting for less than 4% of crowding variance across all locations, encounter types, and activity; (d) specialized boaters were less likely to care about encounters with kayakers and canoers than nonspecialized users; (e) for rafters, preferred encounter levels explained more crowding variance than perceived encounters, whereas for kayakers and canoers the predictive effect of preferred versus perceived encounters depended on the type of encounter; and (f) kayakers and canoers felt significantly more crowded at the rapids and on the river than rafters, but there was no difference at the put-in.

Study Limitations

At least three limitations to the study should be recognized. First, the setting was a high-density river recreation area in which most users were nonspecialized boaters. This clearly contributed to the low predictive effect of tolerable encounter levels (relative to perceived and preferred encounters). Our findings apply only to high density river settings and should not be extended to low- or moderate-use rivers. Second, the moderate–high correlations observed between perceived and tolerable encounter levels raises a concern with multicollinearity in the regression analyses. It also suggests that respondents may have been unable to differentiate between perceived and tolerable encounter levels. It is recommended that future studies measure all three independent variables (preferred, perceived, and tolerable encounter levels) on-site and immediately after the boating trip is completed. Third, the difference between high versus low specialized users in our study is relative and not absolute. The findings of Objective 2 should be interpreted with some caution because the data are probably not representative of the entire continuum of specialized to nonspecialized rafters and kayakers–canoers.

Theoretical Implications

Our findings provide partial support for the model of crowding investigated in this study, but they also suggest that other approaches may be more appropriate for specific situations within a single recreation setting (particularly for encounters with kayakers and canoers). According to social interference theory, crowding occurs when actual or perceived use levels exceed desired levels (Schmidt & Keating, 1979). In our study, both rafters and kayakers–canoers reported they saw more rafts than they could tolerate (across all locations), supporting the social interference hypothesis. However, with only one exception (rafters encountering kayakers and canoers on the river), both groups reported seeing fewer kayakers and canoers than they could tolerate, suggesting that interference probably did not occur for encounters with kayaks and canoes. Because interference between users is a prerequisite for crowding (Heberlein, 1977; Schmidt & Keating, 1979; Stockdale, 1978), it is likely that crowding levels would have been relatively low for encounters with kayakers and canoers (as compared to encounters with rafts). Unfortunately, in our study perceived crowding levels were not measured for specific types of encounters (e.g., for encounters with rafts vs. encounters with kayaks and canoes). If crowding levels had

indeed been low for encounters with kayaks and canoes and social interference did not occur, this may explain why our model did not predict crowding levels for encounters with kayaks and canoes.

An alternative theory of crowding, the stimulus overload model, may provide a further explanation as to why perceived, preferred, and tolerable encounter levels did not predict crowding for encounters with kayaks and canoes. Stimulus overload theory suggests that people use various coping mechanisms to deal with crowded situations, such as displacement (i.e., movement to less crowded areas), product shift (a reevaluation of the situation), and rationalization (a change in the beliefs about the outcomes of the situation; Desor, 1972; Schmidt & Keating, 1979). Whereas few studies have examined the rationalization hypothesis, both displacement and product shift have been found to occur in high-use recreation areas. Schindler and Shelby (1995), for example, surveyed the same boaters of the Rogue River in 1977 and again in 1991 and showed that as use levels increased, perceived crowding remained the same. Their findings suggested that boaters had redefined their experience from a low- to a high-density experience in order to reduce perceived crowding levels. Other work has supported both the product shift or displacement hypotheses (or both), showing that boaters modify their evaluation of the experience and move to lower density rivers rather than report increasing crowding at a site (Shelby et al., 1988). Although coping responses were not examined in our model of crowding, displacement and product shift remain plausible explanations for why encounter levels did not predict crowding for encounters with kayaks and canoes on the Nantahala.

However, tangential evidence in our study suggests product shift may have occurred for specialized users. Results of Objective 2 revealed that specialized users were significantly more likely than nonspecialized to report they "didn't care" about encounter levels with kayaks and canoes. This is surprising; one would expect specialized users to have developed salient norms about encounter levels (Hall & Shelby, 1996; Whittaker & Shelby, 1988). The relatively high percentage of specialized users who did not care about encounters with other kayakers and canoers may represent either a shift in the evaluation of their experience or indifference to "same-activity" encounters. Indeed, evidence in the recreation conflict literature supports the hypothesis that interference is more likely to occur for "outgroup" encounters (i.e., a group to which an individual does not belong) than for encounters with user groups to which an individual does belong (Ramthun, 1995). Clearly, future research should address the role of coping factors as well as "outgroup" conflict to help explain crowding for encounters with specialized groups such as kayakers and canoers.

Applied Implications

Results of the study have implications for at least two areas of recreation management: carrying capacity determinations and visitor communication. Based on the limits of acceptable change framework (Stankey et al., 1985) and the work of Shelby and colleagues (Shelby & Heberlein, 1986; Shelby et al., 1989), Tarrant and English (1996) recently proposed an approach for setting carrying capacities based on evaluative standards of perceived crowding levels. This approach recognizes that capacities are reached when they exceed crowding standards for specific recreation opportunities (ranging from the primitive to the developed). In the case of developed high-use settings, such as the Nantahala, several key situational conditions affect these standards. For example, results of the present study suggest that carrying capacities should be much lower for kayak-

ers–canoers than for rafters at certain locations (e.g., rapids) but not at others (e.g., put-in). Furthermore, because use levels appear to be more of a concern for both groups at the rapids than other locations (as reflected by significantly lower encounter preference and tolerance levels), special consideration should be given to determining appropriate carrying capacities at the rapids.

Given that the number of perceived encounters was generally a less effective predictor of crowding than preferred encounter levels (with the exception of kayakers and canoers encountering other kayakers and canoers), simply reducing use levels may not be the only (or the most appropriate) solution to reducing feelings of crowding on the Nantahala River. An alternative approach is directed toward education and communication. Communication strategies that are both informative and effective in modifying user group and public opinions about natural resource issues are being developed and have application to recreational crowding (see, e.g., Bright, Manfredo, Fishbein, & Bath, 1993; Manfredo & Bright, 1991; Tarrant, Overdevest, Bright, Cordell, & English, in press). Communication, for example, can be used to change user preferences and expectations regarding encounters (a) with other user groups and (b) at specific locations within a single recreation setting. Based on our findings, changing boaters' preferences for encounters with rafts (in particular) and at the rapids would probably be an effective approach for reducing perceived crowding levels. Managers of the Nantahala should direct their efforts toward rafters (vs. kayakers and canoers) because encounters with kayaks and canoes appear to be less of a concern for many boaters than encounters with rafters. Furthermore, most rafters are commercial users, so managers could work with outfitters to provide rafters with information about expected use levels and encounters and how crowding is likely to vary across specific locations along the river.

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