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CROWDING MODELS, STRESS, AND WILDERNESS*

Joyce McCarl Nielsen

University of Colorado, Denver

INTRODUCTION

The current environmental crisis might be simplistically described as a situation of dwindling resources in the context of rapid population growth. One of these increasingly scarce resources is physical space, and its relation to a nation's or community's overall quality of life has received considerable attention. Specifically, as both numbers and concentrations of people (e.g. through urbanization) increase, there is concern about the possibly negative, stressful effects of crowding.

Crowding simply means "too many" people in a given physical setting, and is measured either subjectively or by various signs of stress – e.g. lowered productivity, anxiety, aggressiveness, high crime rates, mental illness, etc. Generally speaking, a curvilinear relationship is hypothesized between density (number of people per unit of space) and quality of life. "Crowding" is represented by the combination of high density and low quality of life, while "isolation" is represented by the other end of the continuum – too few people for life enhancement. Somewhere in between these two extremes is "optimal" social density. But this optimal range varies widely because crowding is determined by more than just numbers of people or density. In fact, optimal density is implicitly defined in terms of the absence of stress. That is, only when certain manifestations of stress occur (usually at high density levels) is the situation described as crowded. In short, crowdedness is seen as one form of environmentally induced stress, and many writers, both scientific and popular, think the problem has reached an emergency level in some areas and is potentially problematic in others.

Efforts to measure the potentially stressful effects of density and subsequently develop optimal social densities for various situations have been made by environmental scientists from widely different perspectives. This body of research is of central concern for the development of social policy in urban planning, population growth, health administration, and wilderness recreation management. The purpose of this paper is to describe a composite theoretical model based on the crowding literature, and then show how a carrying capacity model, derived from outdoor recreational research, parallels and constitutes a more specific instance of the basic crowding model. Results of an empirical test of the carrying capacity model carried out in a unique wilderness setting are presented. Interpretation of findings from this study suggest some important modifications of the crowding model.

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CROWDING AS A STRESSOR

Most crowding models are elaborations of the basic theme that crowding is an aversive stimulus and results in psychological and/or physiological stress (see Figure 1-a). Development of this basic hypothesis has taken several directions (see Figure 1-b). First, most writers follow Stokols' (1972) lead in differentiating between crowding as a negative, subjective, experiential state and density (number of people per unit of space) as a physical, and relatively objective, variable. Density, as well as the absolute number of people in a given situation, are the major determinants of amount and type of social interaction. Total number (e.g. group size) is hypothesized to have an independent effect on perceived crowding insofar as it increases the potential number (and possibly rate) of social interactions.

The basic variable intervening between density and crowding is quantity and quality of social interaction, the usual assumption being that the two are negatively related – i.e. the greater the number of people, the less satisfactory the interaction. The direction of this relationship is evidenced by the social psychological concepts and mechanisms suggested as explanations for the link between increased social interaction and perceived crowdedness. These include "interpersonal press" (increased obligations yet reduced opportunities for interpersonal rewards) posited by Galle et al. (1972), information-overload (Milgram, 1970), information-

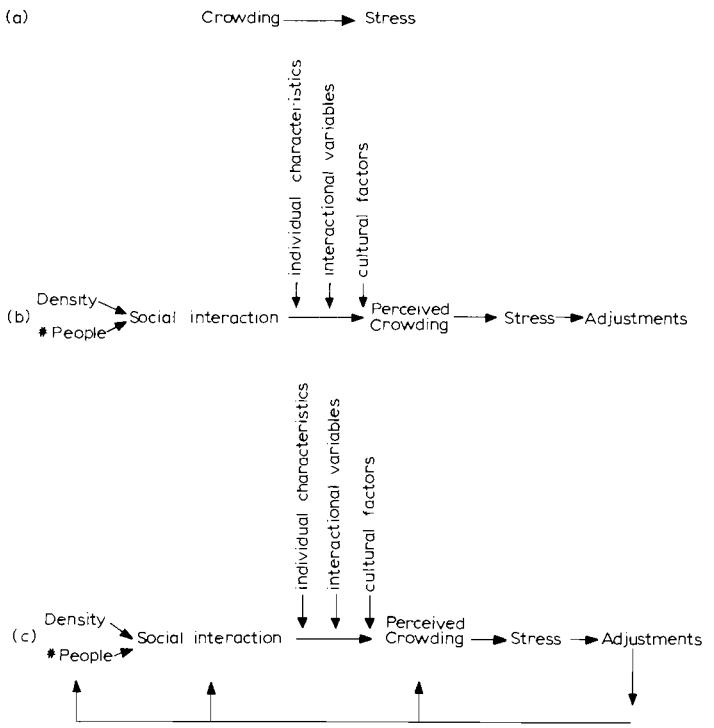

Fig. 1. Crowding model. (This model is based on both implicit assumptions and explicit statements found in the literature. Not all variables are included in all research studies, either empirically or theoretically. For example, the causal sequence implicit in Galle et al. (1972) is: density → interaction → stress. A "perceived crowding" variable is not included. Manderscheid (1975) on the other hand, argues that conscious definition of the situation as crowded is necessary for stress effects to occur. McClelland's (1974) model differs from the above in that crowdedness is equated with "excessive" social interaction; thus the need for an intervening social interaction variable is eliminated. She also included a "physical arrangement of people" variable as a determinant of crowdedness.)

processing and sensory-overload (Rapoport, 1975), intrusions of personal space and territoriality (Sommer, 1969), decreased freedom of choice (Proshansky et al., 1970), and the interference of others with goal attainment (McClelland, 1974). As McClelland points out, the obvious consensus is that "stressful" social interaction is one result of higher density levels [1]. A few writers, however, have emphasized the importance of the quality of the interaction, independent of its quantity (Freedman, 1975) and this has some empirical support. Stokols et al. (1973), for example, found that subjects doing cooperative tasks reported greater satisfaction than those doing competitive tasks, regardless of whether density was high or low.

Because crowding *is* socially defined, a variety of individual (e.g. sex, race, etc.), social, and cultural factors (e.g. norms) which can affect one's evaluation of the social interaction enter the model as mediators. These factors reflect individual, group, and cultural differences in the probability of defining the situation as crowded.

Once a situation is defined as crowded, the link to both psychological and physiological stress (Stokols, 1972; Manderscheid, 1975) is considered rather direct. Stress as the major dependent variable in most crowding studies takes a variety of forms. These include: (1) indices of social pathology like suicide, juvenile delinquency, crime, neglect of children, mental health disorders, mortality and morbidity rates, etc. (see Galle et al., 1972; Mitchell, 1971; Schmitt, 1957 and 1963; Marsella et al., 1970; Myers and Manton, 1974, for examples); (2) reactions at the group level such as decreased performance and interpersonal attraction; (3) subjective evaluations of the situation (e.g. feelings of hostility and aggression) (Freedman et al., 1971; Stokols et al., 1973); (4) behavioral reactions like aggression (Loo, 1972; Mackintosh et al., 1975); and (5) physiological reactions like electrodermal activity (Aiello et al., 1975), and high blood pressure (D'Atri, 1975).

As a reaction to stress, efforts to decrease social stimulation or make other adjustments to crowding are posited. Examples include attempts to change the number of people, enlarge the space, create architectural barriers to stimulation, obtain more resources, leave the situation and redefine rules to modify social interaction (McClelland, 1974). Manderscheid (1975) categorizes stress responses as either adaptive (e.g. modification of the setting, redefinition of the setting, interaction outside the setting, and movement to a new setting) or maladaptive (physical illness stemming from physiological stress and psychoneurotic symptoms). Rapoport (1975) offers numerous examples but, unlike others, does not specify their probability of occurrence.

The least developed aspect of the crowding model is seen in suggested feedback mechanisms between responses to stress (above) and other variables in the model (see Figure 1-c). It is hypothesized that reactions to stress caused by crowding will either (1) change the density, number and/or physical arrangement of the people, (2) reduce, limit, or order social interaction, or (3) result in a redefinition of crowdedness. But guesses as to which mechanism will occur under what conditions are still rather speculative. The potential effects of these mechanisms, however, is clear. Leaving the situation would effect a change in density. A redefinition of space, on the other hand, would bypass density but affect perceived crowdedness. The questions of which adjustment will occur and which temporally prior variables will be affected is important because some adjustments will result in changes in social organization but not density or numbers of people. The implications of this and related issues will be considered in the discussion section.

Empirical research on different parts of this basic model has been carried out at both macro (cities, census tracts, communities) and micro (e.g. small groups) levels; in both field (e.g. department stores, railroad stations,

psychiatric hospitals, aboard ships) and laboratory settings; and with both children and adults. Results from laboratory experimental research (Stokols et al., 1973; McClelland, in press) support the first part of the crowding model, that increased density leads to the perception of crowding, but only a few studies have measured the intervening variable, rate and intensity of social interaction. The link between crowdedness and stress, however, is tenuous at best. Empirical findings relevant to both simple and complex versions of the crowding model are reviewed elsewhere (Freedman, 1975; Lawrence, 1974; McClelland, 1974; Zlutnick and Altman, 1972). The lack of a clear, direct relation between crowding and stress (in humans) is evidenced by reviewers' conclusions. Freedman (1975), for example, argues rather strongly that no independent effects of density have been shown. Lawrence (1974) says:

> The field is confused by definitions, by conflicting data, and . . . by popular conjecture. The animal data are most easily interpreted and possibly of least use to man. The urban findings are inconclusive, demonstrating no unequivocal relationship between population density and social ills. Finally, clinical and experimental models are at odds, and the results of experiments are again inconclusive.
> Perhaps the only certain conclusion that can be drawn at this time is that there is no clear, demonstrable, linear relationship between high density and aberrant human behaviors, or between the social crowding of the individual and aggression.

McClelland (1976), somewhat more cautiously concludes that, "to the extent that crowding increases incoming stimulation and necessitates monitoring of and coordination with others, it will produce arousal, but not necessarily stress or negative affect."

CARRYING CAPACITY MODEL

Another area of research that is concerned with the effects of increasing numbers is that relating to recreational and wilderness management; but it has not yet been related to the body of theory and research on density and crowding described above. The question of acceptable use levels – numbers of people in a given recreation area at a given time – is particularly crucial in recreational settings because most management agencies (e.g. National Park Service, U.S. Forest Service, etc.) have the task of providing recreational areas while preserving the quality of the recreational experience. There is a potential contradiction in these goals to the extent that the number of people being served (i.e. the number engaged in recreation at any one time) reduces the quality of the experience. This is particularly true in the case of wilderness management, since wilderness is by definition an area of low density and low development. With increasing numbers of people using the nation's recreational facilities (Brockman and Merriam, 1973: 163, 167; Catton, 1972) concern for the quality of the wilderness experience has been expressed. There is strong normative demand for retaining low density in wilderness areas. If low density conditions are not met, it is assumed that people either have a "bad" experience or redefine it as a nonwilderness experience. This kind of reasoning is generally shared by managers and recreationists, as well as social scientists doing research in this area. (Cf. Nielsen et al., 1977, and Shelby and Nielsen, 1975, for a review of this literature.) The model, or set of relations assumed to be operating for recreationists in wilderness settings is shown in Fig. 2.

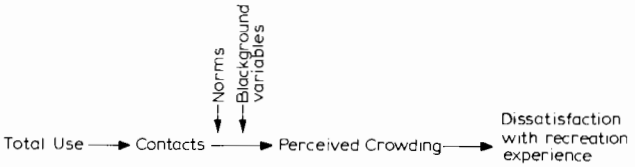

Fig. 2. Carrying capacity model for recreation areas

The model hypothesizes that the greater the total use level in an area, the greater the probability of meeting other parties. Intergroup contacts, along with other personal,

social and physical variables, then determine the extent to which people define the situation as crowded. Crowding, in turn, is seen as decreasing the quality of the experience; thus user satisfaction decreases with increased crowdedness.

A basic similarity between the carrying capacity and crowding models is evident. Total use, of course, is the equivalent of density, and intergroup contacts reflect the social interaction variable found in the crowding model. Perceived crowding is essentially the same and, as in the crowding model, is assumed to be affected by a host of normative, situational, and interactional variables, as well as actual contacts. Finally, satisfaction, a subjective evaluation of the wilderness experience, parallels the stress variable in the crowding model.

One might argue that crowding in a wilderness setting could never be "really" stress-provoking in the way that long-term crowding in a densely populated urban ghetto is. But as indicated earlier, the dependent variable in crowding models takes a variety of forms, and "stress" is used as a general term to describe negative, unpleasant experiences. As Lawrence (1974) put it, for most people crowding means "trouble." Furthermore, if we are to take seriously the hypothesis so often put forward in the literature and reflected in the crowding model, that crowding is a subjective experience affected by normative standards of density appropriate for different occasions, then it is possible to experience "crowdedness" in spite of extremely low levels of density. As Lawrence (1974) argues, three people can feel crowded if the normative constraints of the situation are such that three is a crowd [2]. At any rate, density is potentially independent of crowdedness, and if crowdedness is affected by norms, a theory of the effects of crowding should apply as well to low density crowded situations as to high density ones. Serious consideration of a normative component in determining "perceived crowding," then, leads one to argue that wilderness, socially defined, is a low density situation, and the threshold for reacting to crowdedness is low. Indeed, this low threshold (compared to urban settings) makes the wilderness situation an ideal one in which to test the crowding model. This is not to suggest that sociological and psychological potential for contact in the urban setting is unlimited. Rather, the argument is that, generally speaking, expectations about appropriate numbers of contacts in the wilderness are much lower than that for urban settings. Thus, the effects of increasing density should be clearly evident when that threshold is reached.

The wilderness context also provides a good test of crowding effects because some of the potentially confounding physical (noise, lights, heat) and perceptual (openness and visual escape) variables often associated with density (Carson, 1972; McClelland and Auslander, n.d.), are not present in the wilderness setting. Thus, effects of amount of contact, independent of other variables associated with density, should be more easily ascertained.

Finally, the wilderness setting is unique in that recreationists are usually engaged in a particular activity (backpacking, hiking, camping, river-tripping, etc.) that involves rather intense and special kinds of relations with the physical environment. Because of this, the importance of *intragroup* social interaction might be overshadowed by the importance of the physical environment. In addition, *intergroup* contacts that interrupt, impede or in other ways disturb the person-environment relationship, may be even more salient.

EMPIRICAL TEST OF THE CARRYING CAPACITY MODEL

A study designed to test the assumptions underlying the carrying capacity model described above was carried out during 1974 and 1975 [3] on Colorado River rafting trips through the Grand Canyon area. The Grand Canyon is an unparalleled natural area. The Colorado River flows through the Canyon for 280 miles from Lee's Ferry to the Grand Wash

Cliffs, and provides an incomparable outdoor whitewater experience. River trips through the Grand Canyon begin at Lee's Ferry, Arizona. The first point at which passengers can debark is Phantom Ranch, 88 miles downstream, but most go on to either Diamond Creek (mile 225, the first point where boats can be taken out) or Pierce's Ferry (mile 280). Motorized trips float the river on large (30–40 foot) pontoon rafts, and take between 5 and 11 days to traverse the canyon. Oar-powered craft are generally smaller (15–25 feet) and take a longer time (12–18 days to make the trip). At night, recreationists camp on natural beaches along the river. During the day, they travel on the river.

In addition to river travel, stops are made at visitor attraction sites. These are places of scientific, historical, or aesthetic interest. They include side canyons, tributary streams, waterfalls, swimming holes, etc. The number and length of these stops varies from one trip to another.

Compared to the duration or length of other situations in which crowding effects are usually studied, then, river trips fall between short-term laboratory situations, short-term field experiments, and long-term permanent living situations.

Procedure

During the 1974 and 1975 seasons, participant observers accompanied a sample of river trips through the canyon. During the trip, observers recorded information about contacts with other parties and other trip characteristics. Before the end of the trip, passengers completed questionnaires which were administered and collected by the observer. Information on use levels was obtained from the National Park Service records at the end of each river-running season. Data sources, then, include observers' trip reports, passengers' questionnaire responses, and National Park Service use records.

Measurement

"Use levels" refer to the number of people on the river during a specified period. Although all river trips begin at Lee's Ferry, they travel at quite different speeds, taking between 5 and 18 days to traverse the canyon. Fast trips, then, may encounter and pass trips that left several days before them, while slower trips are passed by those leaving later. For this reason, the measure of use level employed was total number of people or trips leaving Lee's Ferry during the week a given trip (in our sample) left. This 7-day period included the departure date and three days before and after it. During 1975 the number of people per week leaving Lee's Ferry varied from 80 to 950.

"Inter-group contacts" [4] are of two kinds, those taking place on the river and those occurring off the river at attraction sites. Their number, duration, quality (friendly, hostile, or neutral), were recorded.

Questionnaire responses included measures of perceived crowdedness, wilderness values, standard background variables, and user satisfaction with the experience. Wilderness values include endorsement of anti-artifactualism (i.e. against development of wilderness areas), attitude toward artifacts in the Grand Canyon, reported river-running experience, degree of participation in outdoor recreational activities, and mode of travel (i.e. motor or oar). Perceived crowding measures were divided into general perceptions (the whole trip) and specific evaluations of river, attraction site and campsite contacts. The user satisfaction variable is based on a rating of the overall quality of the trip from "poor" to "perfect."

Results

Data pertaining to the three basic relations specified in the carrying capacity model will be presented and then discussed in terms of their potential for modifying the crowding models presented earlier.

TABLE I

Correlations of Contact Variables With Use Level

Variable	Correlation With Use Level (People Per Week)
Trips per week	0.94
River encounters	
Contacts per day	0.68
Time in sight (minutes)	0.47
People per day	0.65
Attraction site encounters	
Percent of sites (total) w/contact	0.58
Probability of meeting another trip at:	
Little Colorado River	0.28*
Elves' Chasm	0.69
Deer Creek	0.43
Havasu Creek	0.31*
All four sites	0.58
Number of people met at:	
Little Colorado River	0.25*
Elves' Chasm	0.43
Deer Creek	0.26*
Havasu Creek	0.33*
All four sites	0.51

*$p < 0.05$
All other probabilities are less than 0.01

TABLE II

Variables Related to User Satisfaction

Variable	Correlation with Trip Rating*	
	1974	1975
Personal benefits		
Subjective learning	0.23	0.30
Personal Growth	0.15	0.19
Social aspects		
Quality of group experience	0.34	0.32
Rating of boatman	0.29	0.36
Easy to ask boatman questions	**	0.32
Wilderness character of the experience		
Perception of canyon as wilderness	0.20	0.10
Evaluation of trip as a "nature experience"	0.31	0.31
Perception of use impact (ecological)	–0.23	–0.19
Artifactualism (in Grand Canyon)	–0.18	–0.29
		–0.14
Weather bad	**	–0.22
Trip pace (leisurely)	**	0.28

*$p < 0.01$
**1974 data not available

As expected, probability of contact increases with use level ($r = 0.68$). For more detailed information regarding the relation of use level to probability of contact on and off the river see Table I. There was no relation between river contacts and perceived crowding ($r = 0.05$) and a low but significant correlation ($r = 0.12$, $p < 0.01$) between attraction site contacts and perceived crowding. It should be added that correlations between perceived crowding and contacts were not significantly different for respondents who measured high on several indicators of wilderness values, defined as wilderness "purists" by Hendee et al., (1968) and Stankey (1973). Finally, the correlation between perceived crowding and satisfaction is statistically significant but not substantively important ($r = -0.14$, $p < 0.01$).

In sum, results show a relation between density and contacts, but little effect of density on perceived crowdedness or of perceived crowdedness on user satisfaction. Factors that *were* related to user satisfaction are listed in Table II and include personal benefits, social aspects of the trip, and the wilderness character of the experience.

In short, our findings parallel those reported in other studies of crowding. *Density seems to have little or no effect on the overall rating of one's experience, but other variables like background characteristics and those relating to the kind and quality of the social interaction do.*

DISCUSSION

It was argued that the wilderness setting would be a likely test for density effects

because of the importance of low density norms. Yet, in spite of wide variation in the number of people on the river and its environs at any given time (use levels ranged from 80 to 940 persons per week) and a wide range in contact levels (from 0 to 9.5 per day), these had little effect on perceived crowdedness, and perceived crowdedness had little effect on subjective evaluations of the experience. Our argument, however, hinged on the importance of shared norms about use levels in wilderness areas. Since a high percent (90%) of the sample was composed of people on their first Grand Canyon river-running trip, it is possible that the assumption of normative standards for wilderness use held by these passengers was a false one. On examination of data relevant to the existence of such norms, it was found that a large proportion of the sample did not in fact have definitive ideas about what to expect in terms of contacts during the trip. Response to questions about *expected* contact are shown in Tables III and IV. As can be seen, 53% did not have an expectation about the specific number of contacts they would have and 36% said they did not know how many people they expected to see. For a good proportion of the sample, then, the situation was normatively ambiguous in terms of expected contact. This may explain the lack of relation between contacts and perceived crowdedness.

A second possible explanation for the lack of density effects has more significant implications for modification of the basic crowding model. Information from participant observer forms and ethnographic field notes support the idea that certain informal mechanisms are operating on the river scene to keep some kinds of contacts at a minimum. We asked participant observers to collect data on the number of times "adjustments for crowding"

TABLE III

Number of River Contact Expectations

Percent response to item, "How many parties per day did you expect to see while floating on the river?"								
NONE	1	2	3	4	5	6–10	11–20	Did not know what to expect
10(93)*	6(60)	11(105)	6(61)	4(39)	4(39)	4(37)	1(12)	53(495)

N = 942
*Figures in brackets represent the number of cases

TABLE IV

Number of People Expected to See Relative to Number Actually Saw

Percent response to question, "Overall, how many people did you expect to see during your trip?"			
Less than you actually saw	about as many as you actually saw	more than you actually saw	did not know what to expect
25(243)*	27(259)	12(115)	36(349)

N = 966
*Figures in brackets represent the number of cases.

were made. Two examples are relevant here. The boatmen, as trip leaders, have some control over the day's scheduling, travel pace, number and location of stops, etc. It was observed that communication between boatmen of different parties often centered around arranging each party's campsite for the night. One of the first (and sometimes the only) question boatmen asked each other was where their party was planning to camp for the night, and agreement that each party would use a different campsite was usually reached. This sometimes involved traveling farther and/or faster than planned, slowing down, or simply changing the location of the planned campsite. But all these maneuvers seemed to be an enforcement of the current river norm that only one party camp on a given beach.

A second example of behavioral adjustments for crowding occurred whenever boatmen passed up attraction sites that were already occupied, as evidenced either by number of people or boats on shore. This occurred more often for minor attraction sites, i.e. ones that could be passed without passengers becoming aware that they had missed something. But for major attraction sites that are either very visible or well known (e.g. the Little Colorado River, Deer Creek Falls, Havasu), this was less possible. As a consequence, higher contact probabilities occurred at these sites (see Table I). Overall, the relation between density level and adjustments for crowding was significant ($r = 0.24$); the relation between contacts per day and adjustments for crowding was even stronger ($r = 0.47$).

The importance of these "adjustment for crowding" behaviors is that they occur either prior to or during contacts, and that they reduce the probability of later, more prolonged contact. Findings from other research studies also suggest the existence of density-mediating processes. Stokols et al. (1973), for example, found that groups in smaller rooms (high density) laughed more than groups in the larger rooms (low density). They interpreted this as a possible stress-reducing mechanism that could explain the lack of density effects on other dependent variables. Baum and Greenberg (1975) found that subjects who were convinced that crowding was imminent chose more socially isolated seat positions, avoided contact with others, experienced crowding and discomfort, and generally behaved in ways that could be defined as density-mediating. Kessler's (1966) research with mice showed that under extreme conditions of crowding they showed no increase in pathology once the population had achieved its maximum density and no further population growth was occurring. Under stable growth circumstances pathology was no more frequent than in the uncrowded control group. During the phase of rapid population growth that preceded this plateau, disease was more frequent than in the control group. It seems, then, that the mice had "adjusted" to higher density levels. Finally, results from observational studies of children in free play situations show that increased density results in lowered rates of interaction. The avoidance of interaction could be interpreted as a mechanism of psychological adjustment to high density (McClelland, 1974).

These examples are interesting in light of Freedman's (1975) remark that the lack of crowding effects is not a question of adjustment because there is no sign that any stress has occurred in the first place. His assumption, like others, is that adjustments come after stress. But our results and those cited above suggest the possibility, at least, that adjustments come prior to stress, in anticipation of contact, and that they reduce the probability of interaction. If this is the case, and future research will have to bear this out, then the next question is how soon after an increase in density are adjustments made? And how much of an increase in density is required to stimulate these mechanisms?

CONCLUSIONS

Results from research testing the crowding-stress hypothesis in a wilderness setting are similar to those found in other settings. Specifically, crowding does not cause stress in the form of decreased satisfaction with the river trip. Several conclusions are warranted. First, it would seem that norms regarding appropriate density levels for different settings are probably more important than the amount of research attention given them thus far would indicate. No other research studies that we know of have ascertained expectations about density levels either before or during the situation being experienced. Rather, most experiments ask whether the subjects felt crowded, after the experience, on the apparent assumption that norms existed ahead of time and were operating to help determine whether the situation is defined as crowded. Furthermore, it would seem that when no specific or definitive density norms for a given situation exist prior to the experience, they might be developed *during* the experience. It may be, for example, that our subjects endorsed the one party per campsite rule because that is what they experienced. Whatever density level one encounters, then, might be defined as "normal" and therefore acceptable, and this might explain why reaction to high, medium, and low levels of contact did not differ for our respondents.

If the development of crowding norms for other settings (e.g. urban ghettos, department stores, etc.) also occur "on the scene," so to speak, this would explain the lack of a "crisis" orientation by people constantly exposed to high density. One result of norm development or even shifting norms based on actual experience rather than "optimal" environments might be that people (or users) do not define situations as "emergencies" even though experts (or purists) do. Behaviors that essentially ignore warnings of potential disaster – like building homes on flood plains or discounting hazard warning signals – might be relevant here. As Dubois (1973) has suggested, perhaps human adaptability which facilitates adjustment to what appear to be unpleasant environments in the short run will be detrimental to the species in the long run.

A second conclusion is that there is some evidence that adjustments for crowding occur earlier than is suggested by the crowding model. Rapoport's (1975) extensive list of density-mediating effects (which includes physical arrangements that reduce interaction like doors, curtains, etc., the development of social rules to reduce social interaction, and psychological mechanisms like withdrawal), illustrates the diversity and widespread occurrence of these mechanisms. In animals, density-regulating mechanisms seem to occur partly as the result of physiological stress (Wynne-Edwards, 1965). But density-mediating mechanisms may occur in human interaction situations much earlier than previously thought, thus explaining the lack of stress effects in density research. If this is the case, then sociological organizing mechanisms and psychological perceptual processes take on a new importance. Density, number of people, and physical arrangements of people may provide the necessary but not sufficient conditions for "crowdedness," while social interaction and its organization determine whether crowdedness will occur.

NOTES

1 The tendency to attribute less rewarding interaction to higher interaction rates is most evident in descriptions of crowded urban slum areas. The implications seem to be that with so many people, one will not get much attention from significant others and yet be exposed to more social presence than wanted. The opposite hypothesis – that the presence of others results in positive interaction and facilitates goal attainment – is possible, probable, and evident in everyday social life but often only grudgingly acknowledged by environmental social scientists writing in this area.

2 Lawrence (1974) carries to its logical extreme the argument that crowdedness is an intrapsychic phenomenon, arguing that "the imagined presence of others" by a

hallucinating person could be called crowdedness. We prefer to underscore the impact of crowding norms that are attached to social situations. Otherwise, the physical variables (density, number of people, and their arrangement in space) become totally unrelated to the rest of the variables in the model. One is left with a model of social interaction rather than one of crowding.

3 The 1974 research was a pilot study based on a purposive sample of 11 trips. The 1975 data represent results from a representative sample of 50 river trips for the season. With some exceptions, results from both years show strikingly similar patterns.

4 It should be noted that intragroup as well as intergroup interaction exists and possibly influences the perceived crowdedness of the situation. Recreation research shows that most people visit recreational areas with a small group of primary acquaintances (Hendee et al., 1968). Occasionally, of course, larger, more formal groups like girl scouts and hiking clubs are the social medium for wilderness or outdoor recreation. But in general, one of the purposes or motives for engaging in wilderness recreation is to seek "solitude," which means low intergroup interaction but not necessarily minimal intragroup interaction. River trips, compared to other forms of recreation, are somewhat unique in that (1) they are generally larger (group size ranges from 15 to 40) and (2) the degree of previous acquaintance among group members varies. They can be composed of people who knew each other before the trip, people who were strangers before the trip, and, of course, mixed groups. After spending several days camping, eating, and hiking together, a sense of group identity usually develops. We feel justified in defining people in each group as a unit which comes into various degrees of contact with members of other groups. In short, we are defining social interaction as intergroup contact rather than intragroup contact. The latter may affect user satisfaction, but its effect is presumed to be independent of density. The former is presumed to increase with total use.

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