Measures of Wilderness Trip Satisfaction and User Perceptions of Crowding

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Abstract—The inverse relationship between user perceptions of crowding and satisfaction with the wilderness experience was studied in three national wilderness areas in Oregon (1991) and in four state wilderness areas in the Adirondack Park of New York State (1997). User perceptions of crowding were correlated (low negative coefficients) with user satisfaction on the wilderness trip experience, but only a small proportion of the total variance was explained in the path analysis models. The authors emphasize that future research should identify what contributes to wilderness trip satisfaction since satisfaction often remains high despite perceptions of crowding.

Wilderness managers, regardless of where they are located in the United States, are often concerned about managing recreational use levels. Some of the indicators of recreational use, and their impacts on other users, include user densities, opportunities for solitude, perceptions of crowding and user satisfaction with the wilderness experience. The general conceptual model is that user densities affect user perceptions of crowding which, in turn, affect user trip satisfactions (Graefe and others 1984; Manning 1985 and 1999; Shelby and others 1989). User perceptions of crowding are expected to be influenced by the numbers of other users within a specific place, the numbers of large groups, distance between users, the user expectations about numbers of other users in relation to the actual experience of use levels, and other variables (for example, user preferences, motivations, type of group). The satisfactions of users are, at least partially, influenced by their perceptions of crowding during wilderness experiences (Manning 1999). Measures of satisfaction have been used by recreation managers to assess current and changing social conditions; however, some authors suggest that satisfaction is difficult to measure (that is, it requires more than a single normative variable to measure) and may require complex models to appropriately and correctly assess fulfillment during the experience (Williams 1989).

The intent of this study was to explore these density-crowding-satisfaction relationships with several data sets, using similar models to predict satisfaction. Based on previous studies, we expected that density and crowding would explain only a small portion of the variance in overall trip satisfaction. Several analytical techniques (parametric and nonparametric) are used to show that trip satisfaction is only partially influenced by user perceptions of crowding during wilderness experiences. The implication is that positive indicators of satisfaction may help explain more about overall trip satisfaction than density and crowding, which are potential negative influences on satisfaction.

Methods

The selected wilderness user studies had to include similar variables for exploring the density-crowding-satisfaction relationships. The relationship between user perceptions of crowding and trip satisfaction was studied using data collected in four state wilderness areas in the Adirondack Park of New York during the summer of 1997 and in three national wilderness areas in Oregon in 1991. The New York State definition of wilderness is nearly identical to the national wilderness definition, with only minor differences, and the recreation management issues and approaches are similar.

The general research design was to sample users at high-use trailheads and conduct brief field interviews. A follow-up mail survey was then conducted with reminders, as necessary. Of the users briefly interviewed and sent a mail survey, 67% to 82% responded to those surveys (table 1). All statistical tests were conducted using the Statistical Package for the Social Sciences (SPSS version 7.5 for Windows, AMOS for SPSS version 3.61, and Answer Tree 2.0) software package.

Table 1—Comparison of the seven wilderness user survey returns and response rates.

Wilderness area	Mail survey response rate	Sample size for analysis
New York State (1997)		
High Peaks	67%	462
Siamese Ponds	74%	72
Ha-Da-Ron-Dah	75%	69
St. Regis Canoe	75%	183
NWPS in Oregon (1991)		
Mt. Jefferson	82%	594
Mt. Washington	80%	241
Three Sisters	82%	636

Six variables were analyzed from the mail survey data in the four state wilderness areas of the Adirondack Park:

- total number of hikers/canoes seen on the trip (continuous variable),
- total number of large groups seen on the trip (continuous variable),
- number of hikers/canoes seen compared to what was expected (five-point scale),
- number of large groups seen on the trip compared to what was expected (five -point scale),
- user perceptions of crowding (five-point scale), and
- overall trip satisfaction (five-point scale).

The six variables in this analysis were tested for statistical differences between the four wilderness areas, using ANOVA to determine if any of the data sets were similar enough to be combined. Statistical analysis included: (1) measuring correlation coefficients between the six variables, (2) predicting satisfaction using a conceptual model with a path analysis technique (first five variables are independent and satisfaction is the dependent variable), and (3) segmenting users group by their responses to the satisfaction question and the other five variables. There are some differences in how these variables were measured in the St. Regis Canoe Area compared to the other three wilderness areas (for example, number of canoes compared to number of hikers, three response categories compared to five categories for perception of crowding).

Five variables were analyzed from the mail survey data in three national wilderness areas in Oregon:

- total number of hikers seen on the first day of the trip (continuous variable),
- total number of hikers within speaking distance on the first day of the trip (continuous variable),
- number of hikers seen compared to what was expected (five-point scale),
- user perceptions of crowding (nine-point scale), and
- overall trip satisfaction (10-point scale).

The five variables in this analysis were tested for statistical differences between the three wilderness areas, using ANOVA to determine if any of the data sets were similar enough to be combined. Statistical analysis included: (1) measuring correlation coefficients between the five variables, (2) predicting satisfaction using a conceptual model with a path analysis technique (first four variables are independent and satisfaction is the dependent variable), and (3) segmenting users group by their responses to the satisfaction question and the other four variables.

Results and Discussion _____

The analysis results are presented in the following order: (1) the ANOVA results are used to determine if the data sets are similar enough to be aggregated together for subsequent analysis, (2) the bivariate correlation coefficients to show the relationships between the variables used to construct the prediction and segmentation models, (3) the user satisfaction prediction model using a maximum likelihood path analysis, and (4) the segmentation of user satisfaction using a nonparametric model.

Aggregating Wilderness Area Studies

The six variables from the studies of users in the four state wilderness areas of the Adirondack Park were tested in an ANOVA procedure to determine if the data sets were similar and could be used in aggregate instead of as four separate area comparisons. The results of the comparisons using both the Scheffe and LSD ANOVA statistical tests ($p<0.10$) indicated that there were significant differences between the High Peaks users and three other wilderness area user groups on five of the variables. The responses of Siamese Ponds, Ha-Da-Ron-Dah and St. Regis area users were not significantly different for the five independent variables. The only variable for which there was no statistically significant difference between the four areas was trip satisfaction (dependent variable). Based on the differences between the High Peaks user responses and the other three wilderness areas, the following analysis results are divided into two groups: (1) High Peaks Wilderness users, and (2) the Siamese Ponds, Ha-Da-Ron-Dah and St. Regis area users aggregated together.

The five variables from the studies of users in the three national wilderness areas in Oregon were tested in an ANOVA procedure to determine if they were similar and could be used in aggregate instead of as three separate area comparisons. The results of the comparisons using both the Scheffe and LSD ANOVA statistical tests ($p<0.10$) indicated that there were significant differences between the three area user groups for most of the variables. Thus, the following analyses consider each of these three area studies separately.

Bivariate Correlations

The average number of users seen on a trip in the New York areas ranged from 10 users (or canoes) in the Siamese Ponds, Ha-Da-Ron-Dah and St. Regis Canoe area to 45 hikers in the High Peaks Wilderness. The relationship between the number of hikers/canoes seen on the trip and the number seen, compared to what was expected, was an overall positive Pearson correlation coefficient (table 2). The correlation coefficients between these two variables were very similar for the High Peaks and other three wilderness areas, even though the average number of users seen in the High Peaks was substantially higher than the other three areas. The number of large user groups (more than 10-12 users) seen on a trip in New York areas ranged from one group in the Siamese Ponds, Ha-Da-Ron-Dah and St. Regis Canoe area to two in the High Peaks Wilderness. The relationship between the number of large user groups seen on the trip and the number seen, compared to what was expected, was an overall positive Pearson correlation coefficient (table 2). The correlation coefficients between these two variables were very similar for the High Peaks and other three wilderness areas.

The average number of user groups seen at a distance on a trip in Oregon areas averaged from one in the Mt. Washington Wilderness areas to two in the Mt. Jefferson and Three Sisters Wilderness areas. The relationship between the number of hiker groups seen at a distance on the trip and the number seen compared to what was expected was an overall positive Pearson correlation coefficient (table 2). The

Table 2—Pearson correlation coefficients[a] between variables in the wilderness user surveys.

New York State wilderness areas	Number of hikers/ canoes seen compared to seen and expected	Number of large groups seen compared to seen and expected	Seen and expected number of hikers/ canoes compared to perceptions of crowding	Seen and expected number of large groups compared to perceptions of crowding	Perceptions of crowding compared to satisfaction
High Peaks	0.26	0.29	0.47	0.30	-0.28
Siamese Ponds, Ha-Da-Ron-Dah, St. Regis Canoe	0.30	0.33	0.44	0.39	-0.37

NWPS Wilderness areas in Oregon	Number of hiker groups seen at a distance compared to seen and expected	Number of hiker groups seen within speaking distance compared to seen and expected	Seen and expected number of hiker groups compared to perceptions of crowding	Perceptions of crowding compared to satisfaction
Mt. Jefferson	0.18	0.31	0.38	-0.36
Mt. Washington	0.19	0.22	0.26	-0.12[b]
Three Sisters	0.21	0.37	0.39	-0.19

[a]All correlations are significant at p = 0.01 except one relationship.
[b]Correlation not significant at p = 0.01 or p = 0.05.

average number of user groups seen within speaking distance during a trip in the Oregon areas averaged from two in the Mt. Washington Wilderness area to four in the Mt. Jefferson and Three Sisters Wilderness areas. The relationship between the number of hiker groups seen within speaking distance on the trip and the number seen, compared to what was expected, was an overall positive Pearson correlation coefficient (table 2). The correlation coefficients between these two variables were very similar for all three wilderness areas.

Users were asked if they felt crowded during their trips to the New York wilderness areas. Overall, the five response categories and percent response were: 1 = no crowding (57%), 2 = slightly (22%), 3 = moderately (14%), 4 = very (6%), and 5 = extremely crowded (1%). The relationship between the respondent's perceptions about crowding and the number of hikers/canoes seen, compared to what was expected, on the trip was an overall positive Pearson correlation coefficient (table 2). Similarly, the relationship between the respondents' perceptions about crowding and the number of large groups seen compared to expected on the trip was an overall positive Pearson correlation coefficient (table 2). User perceptions of crowding increased substantially when the number seen was more or far more than expected.

Users in Oregon were asked if they felt crowded during their trips to the three national wilderness areas. The nine-point response categories ranged from not at all crowded to extremely crowded. The relationship between the respondents' perceptions about crowding and the number of hiker groups seen, compared to what was expected, on the trip was an overall positive Pearson correlation coefficient (table 2). User perceptions of crowding increased substantially when the number seen was more or far more than expected.

Users in New York were asked to report if they were satisfied with their experiences while on their trips to the wilderness areas. The five response categories for the question about being satisfied and overall percent response were: 2 = strongly agree (55%), 1 = agree (40%), 0 = neutral (3%),

-1 = disagree (1%), and -2 = strongly disagree (1%). The relationship between the respondent's perceptions about trip satisfaction and crowding was an overall negative Pearson correlation coefficient (table 2). The correlation coefficients between these two variables were very similar for the High Peaks and other three wilderness areas.

Users in Oregon were asked to report, using a 10-point scale, if they enjoyed (were satisfied with) their experiences while on their trips to the national wilderness areas, compared to previous wilderness visits. The relationship between the respondents' perceptions about trip satisfaction and crowding were an overall negative Pearson correlation coefficient (table 2). The correlation coefficients between these two variables were different for the three wilderness areas; Mt. Washington survey data did not have a statistically significant correlation coefficient.

User Satisfaction Prediction Model

The independent variables were used to develop a maximum likelihood path analysis that predicted trip satisfaction. The models were conceptually developed based on the published literature and statistically formulated using a structural equation model.

The user satisfaction path model for the High Peaks and for the Siamese Ponds, Ha-Da-Ron-Dah and St. Regis areas is shown in figure 1. The results from this model indicate that there is a high degree of correlation (r) between the total number of users seen and the number of large groups seen. The numbers on top of each rectangle are the squared multiple correlations (R^2) with all previous variables. The relationships between perceptions of crowding and the expected compared to actual user numbers are the strongest relationships. In this multivariate path model, the relationships between perceptions of crowding and trip satisfaction are not as strong as might be anticipated from the bivariate relationships. Overall, this multivariate path model is acceptable and statistically significant (p < 0.01), but it
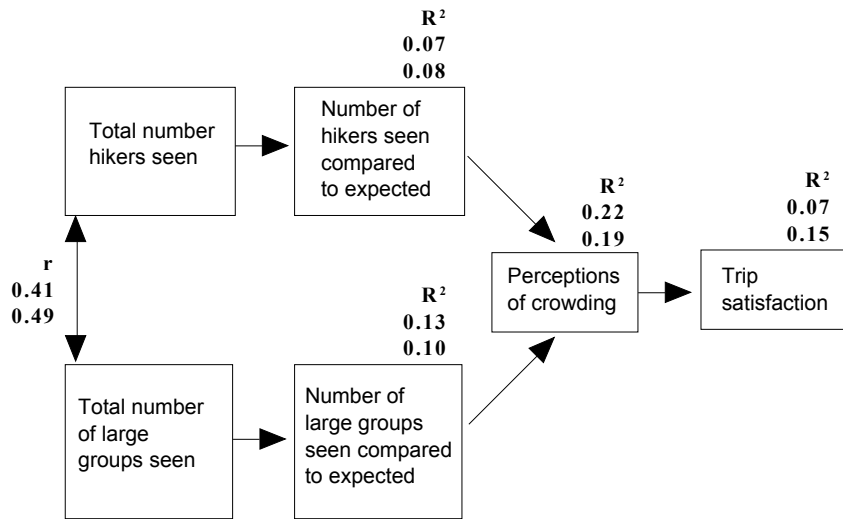
Figure 1—A path analysis model showing the r value correlations between the two exogenous variables and the R^2 values for the four endogenous variables for the survey of users at the High Peaks Wilderness (top number) and the combined Ha-Da-Ron-Dah Wilderness, Siamese Ponds Wilderness, and St. Regis Campe Area (bottom number) in 1997.
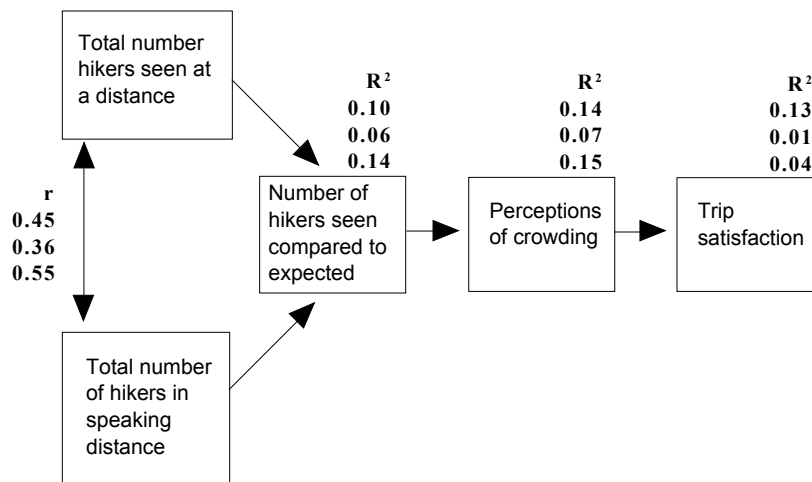

Figure 2—A path analysis model showing the r value correlations between the two exogenous variables and the R^2 values for the three endogenous variables for the survey of users in the Mt. Jefferson Wilderness (top number), Mt. Washington Wilderness (middle number), and Three Sisters Wilderenss (bottom number) in 1991.

explains only a small amount of the variance in the dependent variable—trip satisfaction.

The user satisfaction path model for the Mt. Jefferson, Mt. Washington and Three Sisters Wilderness areas is shown in figure 2. The results from this model indicate that there is a high degree of correlation (r) between the total number of user groups seen at a distance and the number of groups seen within speaking distance. The numbers on top of each rectangle are the squared multiple correlations (R^2) with all previous variables. The relationships between perceptions of crowding and the expected compared to actual user numbers are the strongest relationships. In this multivariate path model, the relationships between perceptions of crowding

and trip satisfaction are not as strong as might be anticipated from the bivariate relationships, especially for the Mt. Washington survey data. Overall, this multivariate path model is acceptable and statistically significant (p < 0.01), but it explains only a small amount of the variance in the dependent variable—trip satisfaction.

User Satisfaction Segmentation

Since only a small portion of the variance was explained in the maximum-likelihood path analysis, there was some concern that the additive linear relationship between the

independent variables and dependent variable might not accurately represent the proposed causal relationship. Another way to explore the relationship between the respondents' trip satisfaction and perceptions about crowding was to use a nonparametric test that included a Chi-squared goodness-of-fit test. The CHAID algorithm in SPSS was used to separate discrete segments of users based on their responses to the trip satisfaction variable and the independent variables. All independent variables were used in the segmentation attempts.

The user segmentation analysis for the High Peaks Wilderness area (table 3) reported a statistically significant difference (Chi-square = 23.5, df = 1, p < 0.01) between two user segments who were: (1) very satisfied and perceived no crowding or only slight crowding, and (2) satisfied and perceived moderate to extreme crowding. Only the perception of crowding variable provided any discriminatory power in this segmentation; no other variable made a statistically significant contribution.

The user segmentation analysis for the Siamese Ponds, Ha-Da-Ron-Dah and St. Regis areas (table 4) reported a statistically significant difference (Chi-square = 16.5, df = 1, p < 0.01) between two user segments who were: (1) very satisfied and perceived no crowding, and (2) satisfied and

Table 3—Reported satisfaction by High Peaks Wilderness users and their feelings about crowding based on segmentation analysis.

| | Feelings about crowding | | |
Satisfaction rating	Not crowded or slightly crowded (n = 259)	Moderately to extremely crowded (n = 90)	Total (n = 349)
	--------- Percent ---------		
Very dissatisfied	0.8	2.2	1.2
Dissatisfied	0.0	5.6	1.4
Neutral	1.5	5.6	2.6
Satisfied	35.9	**50.0**	39.5
Very Satisfied	**61.8**	36.6	55.3
Total	100.0	100.0	100.0

Table 4—Reported satisfaction by Siamese Ponds Wilderness, Ha-Da-Ron-Dah Wilderness, and St. Regis Canoe Area users and their feelings about crowding based on segmentation analysis.

| | Feelings about crowding | | |
Satisfaction rating	Not crowded (n = 172)	Slightly to very crowded (n = 111)	Total (n = 283)
	--------- Percent ---------		
Dissatisfied	0.0	2.7	1.1
Neutral	1.2	3.6	2.1
Satisfied	33.1	**49.6**	39.6
Very Satisfied	**65.7**	44.1	57.2
Total	100.0	100.0	100.0

Table 5—Reported satisfaction by Mt. Jefferson Wilderness users and their feelings about crowding based on segmentation analysis.

| | Feelings about crowding | | | |
Satisfaction rating	Not crowded (n = 187)	Slightly to moderately crowded (n = 230)	Moderately to extremely crowded (n = 58)	Total (n = 475)
	--------------- Percent ---------------			
1	0.5	0.0	1.7	0.4
2	0.5	2.2	5.2	1.9
3	0.5	2.2	15.5	3.2
4	2.1	2.2	5.2	2.5
5	6.4	9.5	13.8	8.8
6	4.8	5.6	10.3	5.9
7	12.3	17.4	**17.3**	15.4
8	19.9	**25.3**	15.5	21.9
9	16.0	20.0	12.1	17.5
10	**37.0**	15.6	3.4	22.5
Total	100.0	100.0	100.0	100.0

perceived slight to very crowded. Only the perception of crowding variable provided any discriminatory power in this segmentation; no other variable made a statistically significant contribution.

The user segmentation analysis for the Mt. Jefferson Wilderness area (table 5) reported a statistically significant difference (Chi-square = 54.3, df = 2, p < 0.01) between three user segments who were: (1) very satisfied and perceived no crowding, (2) satisfied and perceived slight to moderate crowding, and (3) satisfied and perceived moderate to extreme crowding. Only the perception of crowding variable provided any discriminatory power in this segmentation; no other variable made a statistically significant contribution.

The user segmentation analysis for the Mt. Washington Wilderness area reported that no variable made a statistically significant contribution to segmenting user satisfaction (that is, users could not be segmented into different satisfaction groups based on any of the four independent variables).

The user segmentation analysis for the Three Sisters Wilderness area (table 6) reported a statistically significant difference (Chi-square = 19.6, df = 1, p < 0.01) between two user segments who were: (1) very satisfied and perceived no crowding or slight crowding, and (2) satisfied and perceived slight to extreme crowding. Only the perception of crowding variable provided any discriminatory power in this segmentation; no other variable made a statistically significant contribution.

Conclusions

Correlations between the variables within the path model are as expected, according to the published literature, but they explain only a small portion of the total variance in trip satisfaction. The level of expected use varies between higher and lower density wilderness areas, but when user expectations are exceeded, users feel more crowded. Satisfaction is partially influenced by perceptions of crowding, usually

Table 6—Reported satisfaction by Three Sisters Wilderness users and their feelings about crowding based on segmentation analysis.

| | Feelings about crowding | | |
Satisfaction rating	Not crowded (n = 361)	Moderately to extremely crowded (n = 170)	Total (n = 531)
	- - - - - - - - - Percent - - - - - - - - -		
1	0.8	0.6	0.7
2	0.3	1.8	0.7
3	3.0	4.1	3.4
4	1.4	2.9	1.9
5	7.2	11.2	8.5
6	5.2	9.4	6.6
7	12.2	16.5	13.6
8	22.2	**28.3**	24.1
9	15.3	11.7	14.1
10	**<u>32.4</u>**	<u>13.5</u>	<u>26.4</u>
Total	100.0	100.0	100.0

with some negative affect on satisfaction, particularly when crowding is perceived as moderately to extremely crowded. However, the appropriateness of using a density-crowding-satisfaction model (that is, without positive influences) is questionable, since only a small proportion of the total variance was explained in the path models. Manning (1999), in a recently published book, suggests additional components and concepts that will further expand the satisfaction model.

The user segmentation tended to verify that satisfaction and perceptions of crowding are related. While most of these results are statistically significant, and generally as anticipated, some cases in the data sets raise questions about why perceived crowding appears to have no negative affect on some users' satisfaction and why some users are not satisfied but have not perceived crowding to be an issue. Clearly, there are many other factors besides perceptions of crowding that affect satisfaction, and some researchers are measuring those influences (Whisman and Hollenhorst 1998) or are recommending such measures (Manning 1999).

These results, and other published studies on the density-crowding-satisfaction model, generally show that satisfaction is only partially explained by user density (encounters) and perceptions of crowding. However, we are concerned that wilderness managers who want to monitor recreational experiences are using these density-crowding-satisfaction

variables as indicators to assess changing conditions and to determine if direct or indirect management actions are needed to reduce crowding.

We and others (Manning 1999) recognize that further refinements in the density-crowding-satisfaction model are necessary and appropriate. We conclude that the more important question may be "what are the positive influences on wilderness trip satisfaction?" We emphasize that future research should identify what contributes to wilderness trip satisfaction, since satisfaction often remains high despite perceptions of crowding. Based on our research and the published literature, we recommend that future research on satisfaction focus more on how to: (1) operationalize the concept of satisfaction as a multi-dimensional scale of items and not as a single item, (2) use multi-method data collection techniques, both quantitative and qualitative, to better describe and explain user satisfactions, and (3) develop a more complex model of the positive and negative social and human dimensions of the wilderness experience to better predict satisfaction.

Acknowledgments _____

References _____

Graefe, Alan R., Jerry J. Vaske, and Fred R. Kuss. 1984. Social carrying capacity: an integration and synthesis of twenty years of research. *Leisure Sciences* 6(4):395-431.

Manning, Robert E. 1985. Crowding norms in backcountry settings: a review and synthesis. *Journal of Leisure Research* 17(2):75-89.

Manning, Robert E. 1999. *Studies in outdoor recreation: search and research for satisfaction.* (second edition) Corvallis, OR: Oregon State University Press.

Shelby, Bo, Jerry J. Vaske, and Thomas A. Herberlein. 1989. Comparative analysis of crowding in multiple locations: results from fifteen years of research. *Leisure Sciences* 11:269-91.

Whisman, Steven A. and Steven J. Hollenhorst. 1998. A path model of whitewater boating satisfaction on the Cheat River of West Virginia. *Environmental Management* 22(1):109-17.

Williams, Daniel R. 1989. Great expectations and the limits to satisfaction: a review of recreation and consumer satisfaction research. In: Watson, Alan, coord. Outdoor recreation benchmark 1988:—Proceedings of the national outdoor recreation forum assembly. Gen. Tech. Rep. SE-52. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeast Forest Experiment Station: 422-438.