CARRYING CAPACITY & VISITOR EXPERIENCE: CAPE HATTERAS NATIONAL SEASHORE

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Abstract: The number of people living the United States is expected to increase by 63 million by the year 2025, bringing the total population to over 300 million. As population size increases, recreation and park managers can expect to experience an increase in the number of visitors/users. In 2000, the National Park Service recorded nearly 300 million visitors throughout the national park system. Cape Hatteras National Seashore over the past 40 years has recorded a 1200% increase in visitation. Statistics from the first half of 2001 reveal a 29% increase in visitation when compared to the first half of 2000. Located on protected barrier islands in North Carolina, Cape Hatteras National Seashore consists of more than 70 miles of shoreline and 30,000 acres that serve as a notable tourist and recreation destination. As population and park visitation increases, protecting these destinations, and the resources and experiences they provide are of major importance to recreation and park managers. Current and accurate information is needed to better understand the influence of crowding and carrying capacity on park resources and visitor experiences. The purpose of this research is to determine social carrying capacity based on selected variables at Cape Hatteras National Seashore, and to the existing body of literature. A sample of 300 on-site and mail-back questionnaires of visitors to Cape Hatteras National Seashore conducted during a yearlong study, spanning from May 2001 to May 2002 was analyzed. The purpose of this study focuses on issues of social carrying capacity and comprehending visitor perceptions and expectations of crowding in relation to how the number of people on the beach influence the quality of visitor experience. Visitor standards toward encountering other visitors as well as their perceptions of current use levels, if a relationship exists between crowd sizes expectations and selected crowding variables, and to compare visitor's perceived crowding levels with actual visitor density. Analysis and discussion will focus on the relationships between visitor norms/preferences and actual density and encounter levels
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Introduction

The number of people living in the U.S. is expected to increase by 63 million by 2025, increasing the total population to over 300 million (Mitchell, 2001). In 2000, the National Park System recorded nearly 300 million visitor days (Manning, 2001), and expects visitation to increase to approximately 500 million by 2010 (Wang, 1997). As the U.S. population numbers increase, recreation and park managers can expect to experience an increase in the number of visitors/users. As population and park visitation increase, pressures on park resources and the quality of visitor experience will increase, possibly exceeding carrying capacity. Carrying capacity can be defined as the level of recreation use an area can withstand while providing a sustained quality of recreation (Wager, 1964), and as the level of use beyond which experience parameters exceed acceptable levels specified by evaluative standards (Shelby & Heberlin, 1985).

Recent research indicates that biophysical resources and social resources of parks are at risk of suffering significant impacts with increased recreation demand (Cole, Watson, Hall, & Splidie 1997). Air pollution and the biodegradation of vegetation and soil are occurring due to increasing number of visitors (Andereck, 1993). Manning and O'Dell (1997) report that the quality of the visitor experience degrades as park resources degrade, and as crowding, conflict, or other social impacts occur. Cole (1994) emphasizes that overuse of a recreation area can lead to the degradation of that area and thus reduce the quality of visitor experience. With such impacts from increasing number of visitors and users, park managers are challenged to create a balance between providing recreational opportunities while protecting natural resources (resource carrying capacity) and the quality of visitor experience (social carrying capacity). The National Park Service Organic Act of 1916 (NPSO) mandates park managers, "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations" (http://www.aqd.nps.gov/ard/oa.htm). In order to comply with NPSO mandate and to adequately address potential problems, National Park Service (NPS) managers need current and accurate information to better understand the influence of crowding and carrying capacity on park resources and visitor experiences. The purpose of this study is to determine if the social carrying capacity at Cape Hatteras National Seashore (CAHA) is being exceeded based on selected variables. Russell & McLean (1997) defined social carrying capacity as "the amount

of visitor use that individual visitors can sustain before the number of visitors begins to intrude upon individual quality of the experience".

Since being established in 1953 and over the past 40 years, CAHA has recorded a 1200% increase in visitation. Statistics from the first half 2001 reveal a 29% increase in visitation when compared to the first half of 2000. Located on protected barrier islands in North Carolina, CAHA consists of more than 70 miles of shoreline and 30,000 acres that serve as a notable tourist and recreation destination. As population and park visitation increases, protecting these destinations and the resources and experiences they provide are of major importance to park managers. Present and future park managers are challenged to provide recreational opportunities for increasing numbers of visitors while protecting ecosystems within the park and the quality of individual recreational experiences. Data from this study will be utilized to comprehend visitor standards toward encountering other visitors as well as their perceptions of current use levels. Data analysis will help to determine if a relationship exists between crowd size expectations and selected crowding variables, and will help to compare visitor's perceived crowding levels with actual visitor density. Analysis and discussion will focus on the relationships between visitor norms/preferences and actual density and encounter levels. Researchers and managers can use this information to assess current and changing social conditions regarding visitor experiences. Results will specifically assist and guide NPS managers of CAHA in making appropriate management decisions, maintaining standards of quality, and add to the existing body of literature regarding social carrying capacity.

Data Collection & Methods

Data was gathered at 27 data collection sites that included off-road-vehicle beach access areas, walkover beach access areas, visitor centers/lighthouses, and sound-side access areas within CAHA. Data was collected from May 2001 to May 2002 to control for possible seasonal use differences and account for all types of visitors. At each data collection site the number of people and ORV's were recorded, and at selected data collection sites visitors were chosen on a random basis to participate in the study. Visitors were asked if they would be willing to take part in the research, and those who participated were administered an on-site questionnaire, and given the opportunity to participate in a mail-back questionnaire. Visitors answered a number of questions designed to determine visitors' attitudes toward different activities and resources, preferences for management actions, as well as questions designed to determine their standards toward encountering other visitors and their perceptions of current use levels.

The on-site questionnaire collected general information such as travel distance, length of stay, group size, state, visitor rating of their overall experience in the park, and information designed to determine visitor standards toward encountering other visitors. Visitors were specifically asked to estimate the total number of visitors they have seen on the beach, specify the maximum number of people per day they find acceptable and tolerable, and specify the maximum number of people they should see before managers limit use. The mail-back questionnaire collected additional information about visitor demographics, planned activities, economic analysis, airplane fly-over's, and information to determine visitor perceptions of current us levels. Participants were asked how crowded they felt, how acceptable was the number of people they saw, did the number of people enhance or detract from their experience, and would they have like to seen more or fewer people. Questions were designed on a 9-point scale to allow participants opportunities for both negative and positive responses to other visitors. To increase the response rate, a reminder postcard and mail-back questionnaires were sent to non-respondents.

Results

For the intent and purpose of this study, a random sample of 300 on-site and mail-back questionnaires were analyzed from the research study's on-going larger sample. With this information a representation of the CAHA visitor profile was developed. The data from the 300 visitors of CAHA indicated that the sample was primarily males (65%), white (84.7%), with an average age of 46 years of age. A greater percentage of respondents reported obtaining a college degree as the highest level of education that they have completed. The traveling distance for visitors ranged from 1 to 6000 miles and averaged approximately 411 miles, although a larger percentage of the population came from North Carolina (33%) and Virginia (25%). Visitors to the park traveled in an average group size of 3.5, and the majority of respondents (70.3%) visited 1 to 4 times per year and the larger percentage (78.6%) vacationed 7 days or less. Respondents indicated that recreational fishing (32.5% reported as primary activity), swimming/sunbathing, visiting lighthouses, and bird watching were the top four activities that visitors planned to participate in while at CAHA.

Results from the comparison of visitor encounters to norms (Table 1) shows that the number of people that respondents reported seeing on the beach ranged from 1 to 3000, and the average estimate of people seen on the beach by respondents was 98. This number is below the average maximum acceptable number of people of 210, and far below the average reported maximum tolerable number of people (342), and the maximum number of people before use is limited (357). This indicates that, by in large, visitors in the sample did not feel crowded by other visitors to the park, and that social carrying capacity is not being exceeded. Another interesting point revealed from this data is that even though all visitors were not able

to specify their norms for encounters, more visitors indicated that there was a maximum tolerable number that mattered to them, than a maximum acceptable number, and approximately 45% of participants responded that used should not be limited. Obviously the exact wording used to determine what standards should be applied is very important. Note the difference in averages for the three slightly modified questions dealing with how many people is too many, from acceptable, tolerable, and limiting use.

Table 1 Comparison of Visitor Encounters to Norms

	How many People did you see on the beach today?		What is the maximum number of people per day you would find acceptable to see on the beach?		What is the maximum number of people per day you could tolerate seeing on the beach before you would no longer visit this park?		What is the maximum number of people per day you think you should see along this section of the beach before managers start to limit use?	
	N	%	N	%	N	%	N	%
Matters but I can't Specify	NA	NA	50	16.7	74	24.7	69	23
Does not Matter to me	NA	NA	85	28.3	86	28.7	21	7
Use should not be Limited	NA	NA	NA	NA	NA	NA	134	44.7
Cant Remember	15	5.0	NA	NA	NA	NA	NA	NA
Low	1		0		8		10	
High	3000		5000		4000		2000	
Mean	98.46		210.35		342.04		356.82	

Crowd size expectation data revealed that approximately 95% of visitors had some expectation of crowd size, with 50.3% of them correctly anticipating the number of visitors they expected to see. Approximately 20% of the visitors in the sample expected to encounter fewer people, and 24.1% expected to see more people. Using a one-way analysis of variance, the relationship between visitor's expectations of crowd size and perceived crowding was explored (Table 2).

As expected, this data indicates that visitors who expected to see fewer people on the beach felt significantly more crowded than those with accurate or over-estimated expectations. They felt the number of people they encountered were significantly less acceptable, and believed that the other people on the beach detracted more from their experience than people who expected more visitors, or those who had accurate expectations. With only 6.2% of visitors feeling they encounter a lot more people than they expected, these results do not indicate experience

degradation at this time. One interesting point from Table 2, and similar to other research findings, is that no matter what expectations visitors had about crowd size, they all reported that they would liked to have seen fewer people on the beach.

The relationship between density and crowding measures is shown in Table 3. This data shows that the actual number of people at a site/location has little to do with how respondents perceived crowding at each site. This analysis showing virtually no relationship between visitor density and perceived crowding provides support that the charcter and/or type of use/behavior may negatively impact visitor experiences and the perception of crowd size far more than the actual number of visitors at a site.
Additional examination reveals that although respondents were likely to overestimate the number of people they encountered (average estimate =98 compared to average actual count of 54) on the beach, their estimates were highly correlated with actual visitor counts.

Table 2 Relationship between Crowd expectations and other crowding variables

	How crowded did you feel?		How acceptable is the number of people?		Enhance or Detract from your experience?		Would have like to seen more or fewer people?	
Crowding Expectation	N	Mean	N	Mean	N	Mean	N	Mean
Expected more	70	1.99a	70	3a	70	.91a	68	-.03
About what I expected	143	2.73b	143	2.69b	144	.97b	144	-.13b
Expected fewer	60	4.68c	60	-.12c	60	-.8c	60	-1.97c
Total	273	2.97	273	2.2	274	.57	272	-.51
F	57.518		63.986		29.385		44.51	
Sig. Level	.000		.000		.000		.000	

Table 3 Relationship between density and crowding measures

Perceived Measures	Number of people at site Mean = 54.09	
	r	Sig
How many people did u see?	.542	.000
How crowed did you feel?	-.028	.749
How acceptable is the number of people seen?	.080	.352
Did the number of people enhance/detract from your experience?	.069	.424
Overall, I would you have liked to have seen more or fewer people on the beach?	-.001	.987

Conclusion and Implications

Results from this research will supply information to assist researchers and managers assess current and changing social conditions regarding visitor experiences. CAHA park managers can use this data to guide them towards making appropriate management decisions, maintaining standards of quality, and understanding the influence of crowding and carrying capacity on park resources and visitor experiences. Social carrying capacity research provides managers with frameworks that incorporate resource and social norms into management decisions and actions, and develops indicators and standards of quality for the visitor experience with a focus on perceived crowding. With population growth and increasing number of visitors to parks, managers and decision-makers need information derived from research to help understand park conditions, both biophysical and social, and to comply with the NPSO to protect park lands for future generations.

Data analysis indicated that visitor expectations of crowd size play a vital role in determining how they perceive the number of other visitors. This information can be of importance to park managers to possibly develop appropriate expectations by improving the accuracy of what visitors can expect at the destination. For example, through the use of media resources such as brochures, pamphlets, Internet, managers can portray an image of large crowds. A second note derived from this study is that it is important for managers trying to determine what standards to implement to take into account the specific wording of questions. Particular wording can change how people respond to similar questions. Note the difference in the means of how many people are acceptable, with a mean of 210 and tolerable with a mean of 342. Managers can use the results from this research to focus on understanding relationships between trip activities, specific sites, behaviors, and expectations. Finally, it appears as if regulations or management actions designed to curb undesirable behavior or separate visitors with incompatible uses may be more effective tools to maintain desirable social conditions than limiting numbers of users. In conclusion, we can say that current visitor standards at CAHA on crowd size are not being exceeded. The before mentioned data and the overall visitor experience rating average of 8.89 have provided us

with good indications that social carrying capacity at CAHA is not being reached.

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