CARRYING CAPACITY & VISITOR EXPERIENCE: CAPE HATTERAS NATIONAL SEASHORE

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Abstract: The number of people living in 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. Researchers and managers can use this information to assess current and changing social conditions regarding visitor experiences. Results will specifically assist NPS managers in making appropriate management decisions, maintaining standards of quality, and will add to the existing body of literature regarding social carrying capacity.

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, 1983).

Recent research indicates that biophysical resources and social resources of parks are at risk of suffering significant impacts with increased recreation demand (Cole, Watson, Hull, & Splidie 1997). Air pollution and the biodegradation of vegetation and soil are occurring due to increasing number of visitors (Andercek, 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
visitor and recreation destination. As population and
park visitation increases, protecting these destinations
and the resources and experiences they provide are of
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
take part 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

<table>
<thead>
<tr>
<th>How many People did you see on the beach today?</th>
<th>What is the maximum number of people per day you would find acceptable to see on the beach?</th>
<th>What is the maximum number of people per day you could tolerate seeing on the beach before you would no longer visit this park?</th>
<th>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?</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Matters but I can't Specify</td>
<td>NA</td>
<td>NA</td>
<td>50</td>
</tr>
<tr>
<td>Does not Matter to me</td>
<td>NA</td>
<td>NA</td>
<td>85</td>
</tr>
<tr>
<td>Use should not be Limited</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Cant Remember</td>
<td>15</td>
<td>5.0</td>
<td>NA</td>
</tr>
</tbody>
</table>

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 character 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

<table>
<thead>
<tr>
<th>Crowding Expectation</th>
<th>How crowded did you feel?</th>
<th>How acceptable is the number of people?</th>
<th>Enhance or Detract from your experience?</th>
<th>Would have like to seen more or fewer people?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected more</td>
<td>N=70, Mean=1.99a</td>
<td>N=70, Mean=3a</td>
<td>N=70, Mean=.91a</td>
<td>N=68, Mean=-.03</td>
</tr>
<tr>
<td>About what I expected</td>
<td>N=143, Mean=2.73b</td>
<td>N=143, Mean=2.69b</td>
<td>N=144, Mean=.97b</td>
<td>N=144, Mean=-.136</td>
</tr>
<tr>
<td>Expected fewer</td>
<td>N=60, Mean=4.68c</td>
<td>N=60, Mean=-.12c</td>
<td>N=60, Mean=-.8c</td>
<td>N=60, Mean=-1.97c</td>
</tr>
<tr>
<td>Total</td>
<td>N=273, Mean=2.97</td>
<td>N=273, Mean=2.2</td>
<td>N=274, Mean=.57</td>
<td>N=272, Mean=-.51</td>
</tr>
<tr>
<td>F</td>
<td>57.518</td>
<td>63.986</td>
<td>29.385</td>
<td>44.51</td>
</tr>
<tr>
<td>Sig. Level</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table 3 Relationship between density and crowding measures

<table>
<thead>
<tr>
<th>Perceived Measures</th>
<th>Number of people at site Mean = 54.09</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r</td>
</tr>
<tr>
<td>How many people did you see?</td>
<td>.542</td>
</tr>
<tr>
<td>How crowded did you feel?</td>
<td>-.028</td>
</tr>
<tr>
<td>How acceptable is the number of people seen?</td>
<td>.080</td>
</tr>
<tr>
<td>Did the number of people enhance/detract from your experience?</td>
<td>.069</td>
</tr>
<tr>
<td>Overall, I would you have liked to have seen more or fewer people on the beach?</td>
<td>-.001</td>
</tr>
</tbody>
</table>

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.

References


