INDICATORS AND STANDARDS OF QUALITY ACROSS SPACE AND TIME, AS REFLECTED IN A STUDY IN ACADIA NATIONAL PARK, MAINE

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Abstract.—Recreation indicators and standards of quality may be influenced by: 1) the popularity (or overall use level) of a recreation area and 2) the time of day that an individual chooses to visit a popular site. To examine these connections, data were collected via on-site self-administered surveys at several "high"- and "low"-use sites in Acadia National Park in Maine. Comparisons by location and time were made for several indicator variables, including size of group, length of stay, and number of previous visits, perceptions of crowding at the location, perceptions of problems, and opinions about the park as a whole. Visitor standards for encounters at peak and nonpeak times were also compared. The number of significant differences in indicator variables suggests that recreationists at low- and high-use sites during nonpeak times have different recreation experiences from their peak time counterparts at high-use sites.

1.0 INTRODUCTION

Visits to parks and related areas in the United States have increased markedly in recent decades. With expanding enthusiasm for outdoor recreation has come a growing body of research on the implications of increasing use levels. Questions about how many people and what types of activities can and should be accommodated in parks without creating unacceptable social and ecological changes have been addressed through carrying capacity frameworks, such as Visitor Experience and Resource Protection (National Park Service 1997), Limits of Acceptable Change (Stankey et al. 1985), and Visitor Impact Management (Graefe et al. 1990). Central to these frameworks are indicators and standards of quality. Indicators are "measureable, manageable variables that help define the quality of parks and outdoor recreation areas." Standards define "the minimum acceptable condition of indicator variables" (Manning 2007, p. 27).

A subset of research has examined how visitors who are sensitive to crowding cope with increasing use levels. A person may cope with crowding either through behavioral (e.g., displacement) or cognitive (e.g., rationalization, product shift) means. Behavioral coping can take several forms, from going to a different recreation area to spatial and temporal shifts within the same park or protected area (Manning and Valliere 2001, Manning 1997). In this study, possible spatial and temporal displacements were considered by comparing visitors to high- and low-use sites during peak and nonpeak times at a popular national park.

Acadia National Park, located on an island off the coast of Maine, attracts visitors from throughout the world to its rocky shoreline, scenic ocean drive, mountain summits, rare sand beaches, historic structures, carriage roads, and more than 120 miles of hiking trails. While moderate in size, containing just over 47,000 acres of land, Acadia receives more than 2 million recreation visits per year. Visitation is concentrated during July, August, and September (National Park Service 2008).

Acadia contains several well known "icon sites," including Cadillac Mountain, Sand Beach, and Thunder Hole, which attract thousands of visitors on peak season days. Also within the park are several

lesser known and less visited sites, such as Acadia Mountain and Little Hunter's Beach. During peak season, these alternate sites provide opportunities for lower use recreation. Visitors to these alternate sites may be seeking a different recreation experience from those visiting more popular areas of the park. Visitation at popular sites also fluctuates throughout the day, providing an opportunity to consider how individuals visiting during nonpeak hours (i.e., early in the morning or late in the afternoon) may differ from those visiting during peak daytime hours.

The purpose of this study was to compare visitors based on their spatial and temporal distribution within the park using a carrying capacity framework. The three objectives of the study were to: 1) identify indicators and standards of quality for several locations throughout Acadia National Park; 2) compare indicators for visitors to high-use and low-use sites; and 3) compare indicators and standards for visitors to high-use sites at peak and nonpeak times.

2.0 STUDY METHODS

Data for this analysis were collected from July to August of 2004 and 2005 at 17 sites in Acadia National Park. Questionnaires were self-administered, and included open- and close-ended questions about indicators and standards of quality at each location. Based on discussions with park staff, ten of the 17 sites were identified as "high-use" locations while the remaining seven sites were identified as "low-use" locations. Visitors to each location were surveyed between 9 a.m. and 4 p.m. on pre-selected sample days. At high-use locations, every nth visitor was approached and asked to complete the survey, while at low-use locations a member of each group encountered was asked to participate. Three high-use locations—Ocean Drive, Sand Beach, and Thunder Hole—were also surveyed between 7 a.m. and 9 a.m., and 5 p.m. and 7 p.m. Visitors surveyed during early morning and evening hours were classified as "nonpeak time" respondents; individuals surveyed during the day were classified as "peak time" respondents.

In total, 1,197 questionnaires (72.7 percent response rate) were completed at the 10 high-use locations and 759 (84.7-percent response rate) were completed at the seven low-use locations. At the three high-use locations where visitors were surveyed during different times of day, 387 questionnaires (68.4-percent response rate) were completed during peak hours and 298 surveys (72.1-percent response rate) were completed during nonpeak hours.

3.0 STUDY FINDINGS

3.1 Indicators of Quality

Visitors to the 17 sites were asked about the characteristics of their group, their perceptions of crowding and other problems specific to their location, and their opinions about issues in Acadia National Park in general. Respondents visited Acadia National Park with an average of one to two other people (Table 1). While no differences in group size emerged between those visiting at peak and nonpeak times, respondents at high-use locations came with slightly larger groups than those at low-use sites. Similarly, there were no differences in the amount of time that peak and nonpeak time visitors spent at the three high-use sites. However, visitors to low-use sites stayed at those locations for a longer time than those visiting high-use sites. Visitors to low-use sites reported that they had visited Acadia National Park more times in the past than visitors to high-use sites. In the case of peak and nonpeak time visitors, the opposite finding emerged. On average, those visiting one of the three high-use sites during nonpeak times reported fewer previous visits to the park than those visiting at peak times.

Respondents were asked to rate how crowded they felt at their location on a 9-point scale, with 1 = "not at all crowded" and 9 = "extremely crowded." Overall, visitor perceptions of crowding at their locations were low (Table 2). However, significant differences emerged in both the time and location comparisons. Visitors to high-use sites felt more crowded than visitors to low-use sites. Similarly, those visiting during peak times felt more crowded than those visiting during nonpeak times.

Table 1.—Comparison of visitor characteristics by location and time

	High-use sites	Low-use sites	p	Peak times	Nonpeak times	p
a. How many people (including you) are in your personal group today?	3.10 people	2.84 people	0.000	3.07 people	3.09 people	0.841
b. Approximately how long did you stay at (your location) today?	1.28 hours	1.40 hours	0.035	0.94 hours	0.96 hours	0.849
c. Approximately how many times have you visited Acadia National Park before this trip?*	15.73 times	27.86 times	0.023	20.67 times	6.82 times	0.021

*Responses ranged from 0 to 1,000 previous visits. Two outliers of 2,500 and 10,000 previous visits were removed from mean value calculations. Median values were as follows: high-use sites = 3, low-use sites = 8, peak times = 3, and nonpeak times = 3.

Table 2.—Comparison of perceptions of crowding at sites by location and time

	High-use sites	Low-use sites	p	Peak times	Nonpeak times	p
How crowded did you feel at (your location) today?*	3.05	2.12	0.000	3.50	2.42	0.000

*Mean values based on a 9-point scale, with 1 = "not at all crowded" and 9 = "extremely crowded."

Survey respondents were presented with a list of potential issues at their location and were asked to indicate the extent to which they perceived them as problems. While several potential problems were listed for each individual site, only three were common across the 17 locations considered in this analysis: 1) difficulty finding a parking place, 2) cars parked illegally, and 3) too many people in this area of the park. Significant differences emerged in five of the six comparisons made (Table 3). Visitors to high-use sites rated difficulty finding a parking place and too many people as larger problems than did their low-use counterparts. Similarly, those visiting during peak times of day perceived greater problems with finding parking, illegal parking, and presence of too many people than did those visiting at nonpeak times.

Visitors were also asked four general crowding-related questions about Acadia National Park. Overall, visitors agreed about conditions in the Park as a whole regardless of the place or time that they were surveyed (Table 4). Significant differences emerged in three cases. Though the magnitude of differences was not great, visitors to low-use sites agreed more strongly than did visitors to high-use sites that the park was generally too crowded and that road and traffic conditions create a safety hazard. Respondents visiting at peak times agreed more strongly that the park was generally too crowded than did those visiting at nonpeak times.

3.2 Standards of Quality

Respondents at the three peak and nonpeak time sites (Sand Beach, Thunder Hole, and Ocean Drive) were presented with a series of six photographs in which the number of people or vehicles at their location was varied. Respondents were asked to rate the acceptability of each photograph on a 9-point scale ranging from -4 = "very unacceptable" to +4 = "very acceptable." Visitors were then asked to choose the photograph that showed the use level they 1) would prefer to see, 2) would find so unacceptable that they would no longer visit, 3) thought was the highest level of use that the National Park Service should allow, and 4) thought looked most like the level of use that they saw during their visit.

The series of Sand Beach photographs included 0, 172, 344, 516, 688, and 860 people (Fig. 1). The social norm curve resulting from graphing mean acceptability ratings is shown in Figure 2. For both peak and nonpeak time visitors, acceptability levels decreased as

Table 3.—Comparison of perceptions of problems at high- and low-use sites

	N	Not a problem (%)	Small problem (%)	Big problem (%)	p
a. How much of a problem do you think the following issues are at (your location)? Difficulty finding a parking place					
High-use sites	1133	57.2	29.3	13.5	0.000
Low-use sites	734	63.6	30.5	5.9	
Peak times	492	42.9	38.8	18.3	0.000
Nonpeak times	378	65.6	24.1	8.7	
b. How much of a problem do you think the following issues are at (your location)? Cars parked illegally (on road shoulders, in "no parking" areas)					
High-use sites	620	69.4	23.7	6.9	0.974
Low-use sites	105	70.5	22.9	6.7	
Peak times	229	61.6	26.6	11.8	0.026
Nonpeak times	174	74.1	19.0	6.9	
c. How much of a problem do you think the following issues are at (your location)? Too many people in this area of the park					
High-use sites	1149	62.8	30.3	7.0	0.000
Low-use sites	633	79.5	18.3	2.2	
Peak times	498	55.6	33.5	10.8	0.000
Nonpeak times	365	72.6	22.7	7.1	

Table 4.—Comparison of opinions about issues that apply to Acadia National Park as a whole at high- and low-use sites and at peak and nonpeak times

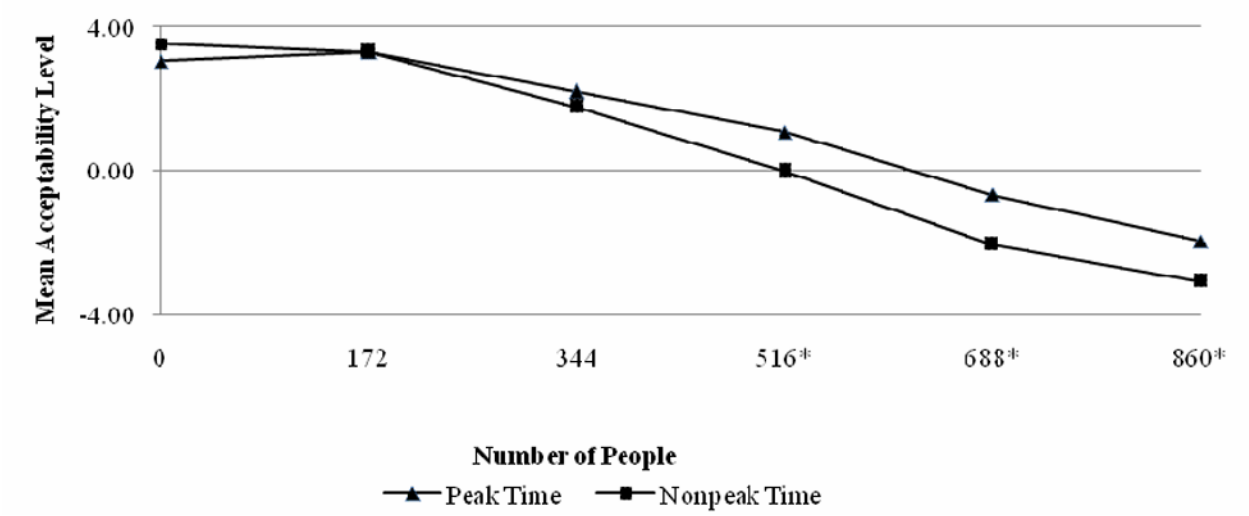
	High use sites	Low use sites	p	Peak times	Nonpeak times	p
a. I generally found Acadia National Park to be too crowded*	3.56	3.38	0.000	3.68	3.83	0.017
b. There should be a limit on the number of people allowed to use Acadia National Park at any one time	3.64	3.65	0.789	3.55	3.64	0.279
c. Road and traffic conditions in Acadia National Park create a safety hazard	3.64	3.51	0.008	3.69	3.72	0.603
d. The number of people using Acadia National Park is about right	2.44	2.46	0.790	2.36	2.36	0.978

*Mean values based on a 5-point scale, with 1 = "strongly agree," 2 = "agree," 3 = "no opinion," 4 = "disagree," and 5 = "strongly disagree."

the number of people in the photographs increased. At the three lowest use levels, there were no significant differences in acceptability ratings between the two groups. At the three highest use levels, however, nonpeak time visitors reported significantly lower acceptability ratings than peak time visitors.

Nonpeak time visitors at Sand Beach indicated that they typically saw fewer people during their visit and generally preferred to see fewer people than did peak time visitors (Table 5). There were no differences between the two groups, however, in their perceptions of the point at which visitor use should be restricted. Both groups perceived that management action would be needed when visitation reached about 550 people. Similarly, both groups indicated that they would be displaced at a similar point (around 730 people).

Figure 1.—Study photographs showing different use levels at Sand Beach.



* Significant difference in acceptability between peak and nonpeak groups

Figure 2.—Social norm curve for number of people at Sand Beach.

Table 5.—Summary of study findings for the three study sites

	Peak Time	Nonpeak Time	p	Peak Time	Nonpeak Time	p	Peak Time	Nonpeak Time	p
	Sand Beach			Thunder Hole			Ocean Drive		
Preference	253	204	0.049	14	13	0.632	5	4	0.360
Acceptability	623	516	--	30	31	--	11	11	--
Management action	542	560	0.522	31	30	0.453	13	13	0.915
Displacement	729	728	0.978	39	40	0.351	16	17	0.603
Typically seen	283	191	0.000	25	18	0.000	7	5	0.001

Numbers represent mean number of people or vehicles in photographs.

Photographs of Thunder Hole showed 0, 9, 18, 27, 36, and 45 people (Fig. 3). The social norm curve resulting from graphing mean acceptability ratings is shown in Figure 4. As with Sand Beach, peak and nonpeak time visitors at Thunder Hole assigned lower acceptability ratings to photographs with greater numbers of people. However, at all six use levels, there were no significant differences in acceptability ratings between the two groups.

As with Sand Beach, nonpeak time visitors to Thunder Hole indicated that they typically saw fewer people during their visit than did peak time visitors (Table 5). However, there were no differences in the two groups in their preference, management action, and displacement ratings. Both groups perceived that management action would be needed when visitation reached about 30 people and perceived that they would be displaced when visitation reached about 40 people.

Figure 3.—Study photographs showing different use levels at Thunder Hole.

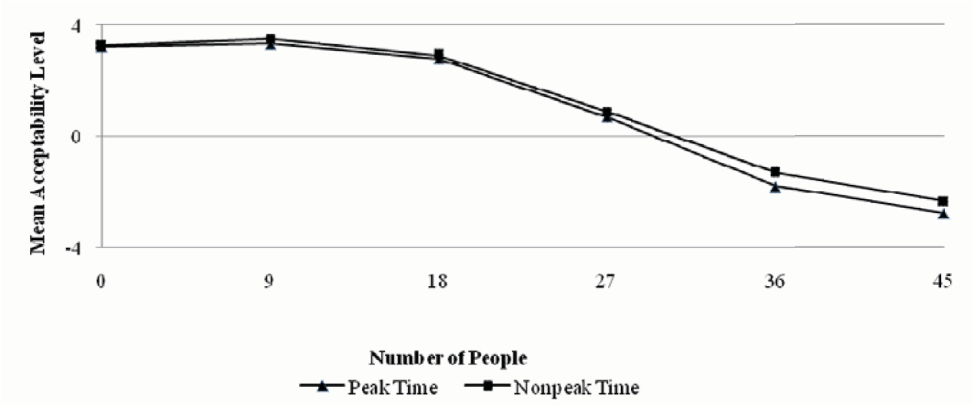


Figure 4.—Social norm curve for number of people at Thunder Hole.

Zero, 4, 8, 12, 16, and 21 vehicles were shown in photographs of Ocean Drive (Fig. 5). The social norm curve resulting from graphing mean acceptability ratings is shown in Figure 6. As with Sand Beach and Thunder Hole, peak and nonpeak time visitors assigned lower acceptability ratings to photographs showing higher levels of use. At all six use levels, there were no significant differences in acceptability ratings between the two groups.

As with Sand Beach and Thunder Hole, nonpeak time visitors to Ocean Drive indicated that they typically saw lower use levels during their visit than did peak time visitors (Table 5). There were no differences in the two groups in their preference, management action, and displacement ratings. Both groups perceived that management action would be needed at 13 vehicles and perceived that they would be displaced when about 16 vehicles were present.

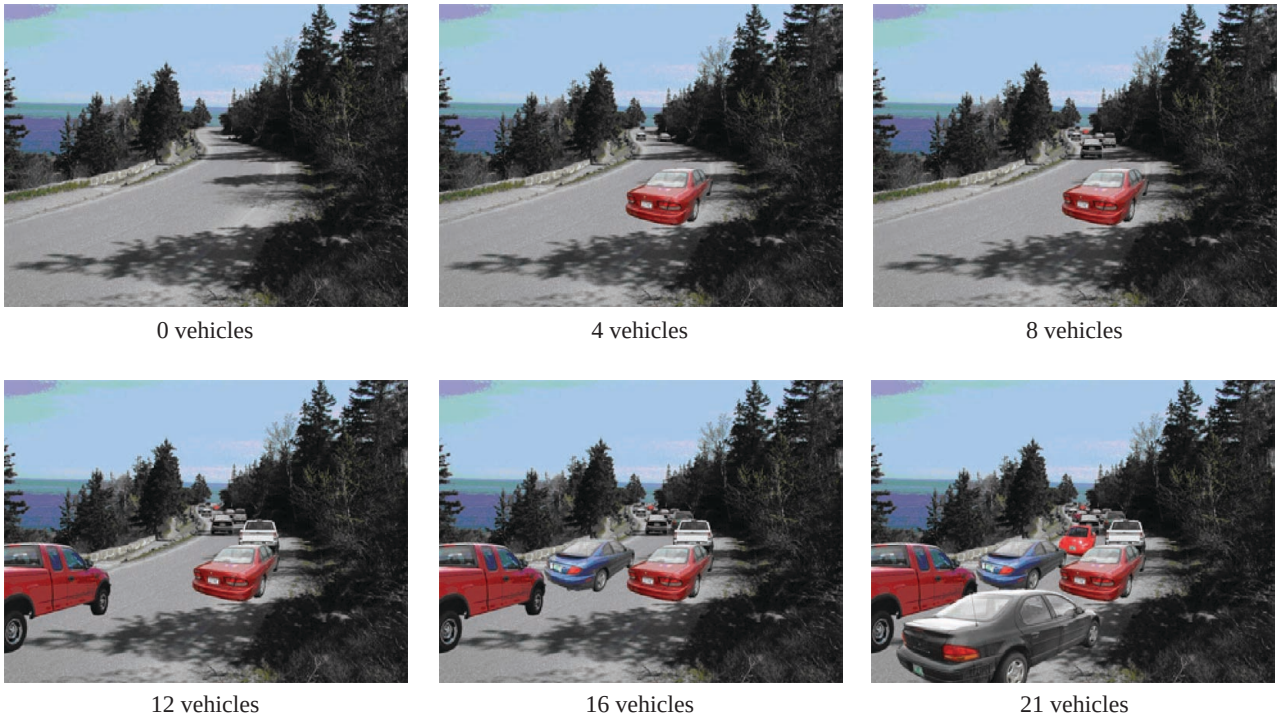


Figure 5.—Study photographs showing different use levels along Ocean Drive.

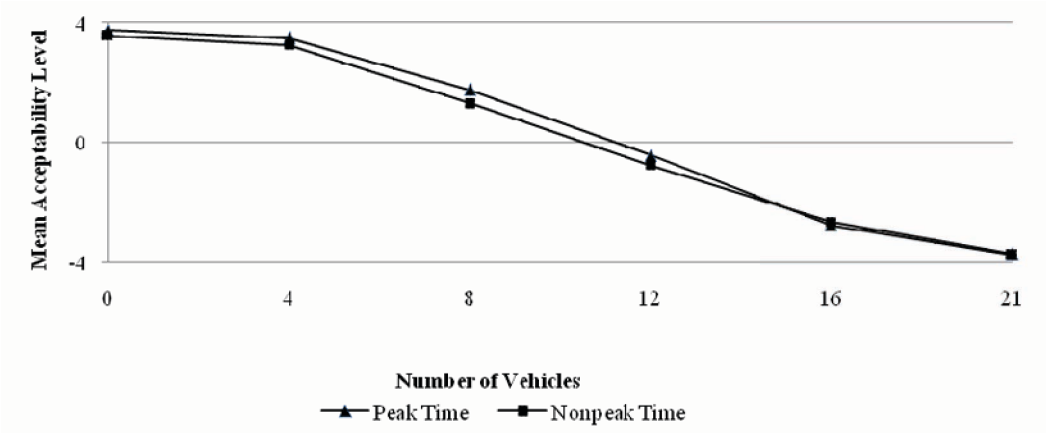


Figure 6.—Social norm curve for number of vehicles along Ocean Drive.

4.0 CONCLUSIONS

Comparisons by location and time were made for a number of indicator variables and related measures, including size of group, length of stay, number of previous visits, perceptions of crowding at the location, perceptions of problems, and overall opinions about Acadia National Park. Significant differences were more prevalent in the high- and low-use site location comparisons than they were in the time comparisons, though similar patterns emerged in both cases.

Visitors to high-use sites belonged to slightly larger groups, stayed a shorter time, and reported fewer previous visits to Acadia National Park than visitors to low-use sites. When asked about crowding-related issues specific to their location, high-use site visitors perceived greater crowding and felt that finding a parking place and the presence of too many people were bigger problems. When considering Acadia National Park as a whole, however, the opposite pattern emerged. In this case, it was the low-use site visitors who felt more strongly that the park was too crowded and that road and traffic conditions created a safety hazard.

Similar to high-use site visitors, peak time visitors perceived greater crowding and felt that finding a parking place, people parking illegally, and too many people were bigger problems at their location than did nonpeak time visitors. Unlike the location comparisons, peak time visitors reported more previous visits to Acadia National Park than nonpeak time visitors. It should be noted, however, that median values for previous visitation were identical for the two groups. Also, when considering Acadia National Park as a whole, the peak time visitors felt the park was more crowded, a finding that seems to contradict the same comparison made by location.

The number of significant differences in the indicator variables suggests that recreationists to low-use sites and to high-use sites during nonpeak times have different recreation experiences than their peak time, high-use site counterparts, who perceived lower crowding and fewer problems at their location. The higher number of previous visits reported by low-use site visitors suggests that these may be displaced individuals who have sought out less popular recreation areas to cope with crowding. However, this hypothesis cannot be confirmed, since no direct measure of displacement was included in the survey instrument.

Comparisons of crowding standards by time revealed few significant differences. As would be expected, nonpeak time visitors at all three locations reported seeing fewer other people or vehicles than did peak time visitors. However, with the exception of a marginally significant difference in encounter preferences at Sand Beach, there were no differences between the two groups in preference, management action, and displacement ratings. Furthermore, the social norm curves were nearly identical for both groups at all three locations, except at Sand Beach, where nonpeak time visitors reported higher unacceptability ratings at the three highest use levels.

Why did so few differences emerge in the peak and nonpeak time standards comparisons? Significant differences in the number of people seen indicate that peak and nonpeak time visitors had different recreation experiences. A comparison of previous visitation suggests that nonpeak time visitors may not be exhibiting displacement behavior. On average, peak time visitors reported that they had previously visited Acadia more times than nonpeak time visitors. Median comparisons suggest that the number of previous visits between the two time groups may not be all that different. Furthermore, peak time visitors agreed more strongly that Acadia National Park as a whole was too crowded. If respondents were visiting at nonpeak times due to displacement, the opposite finding would be expected.

While the indicator comparisons in this study suggest that nonpeak time visitors were not displaced, the findings also suggest that low-use site visitors could be. If so, differences in standards may have emerged between the high- and low-use site groups, had they

been measured. While it may not be appropriate to compare site-specific standards at two different locations, similar high- and low-use sites could be chosen. For example, a general set of beach photographs could be shown to visitors at Sand Beach and Little Hunter's Beach. While this effort would not serve to determine standards at each specific location, it would provide a means for comparing standards for a general beach setting between the two groups.

Future research could examine the link between spatial displacement and standards of quality for crowding and other visitor-caused impacts. Studies should include a direct measure of displacement, and also consider the extent to which cognitive coping mechanisms influence indicators and standards of quality by measuring rationalization and product shift. Future research could also be expanded to include sampling during off-season time periods.

5.0 CITATIONS

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