
Articles

More Visitors, Less Crowding: Change and Stability of Norms Over Time at the Apostle Islands

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Most recreation carrying capacity management is informed by cross-sectional research. But, what happens when visitor composition and perceptions change? This study used a longitudinal design to examine the relationships between changing visitor characteristics, behaviors, normative standards, and perceived crowding at the Apostle Islands National Lakeshore. Annual visitors more than doubled between 1975 and 1985, yet the perception of crowding among boaters *decreased*. This was due to a change in the norm: Boaters in 1985 preferred more encounters. This increasing preference for encounters was largely *unexplained* by changes in the visitor population, most notably a 34% increase in visitors who chartered sailboats. Between 1985 and 1997, preferences for encounters remained stable, but perceived crowding increased as the boater pop-

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ulation aged, boat ownership increased, and visitor experience increased. None of these changes in the visitor population, however, influenced preferred encounters. One hypothesis to explain these processes of norm change and stability is that norms follow use levels, which if correct would challenge the use of norms in capacity determinations. An alternative hypothesis is that boating in the Apostle Islands was a new activity in this place, and that norms were being established during the first period and applied during the second. Our data show that one cannot assume crowding perceptions will increase as visitor numbers increase. Neither can one expect crowding perceptions to remain stable if visitor numbers are constant. Consequently, developing capacities based on a normative model requires continual monitoring of both norms and perceived crowding.

KEYWORDS: *Aging, chartering, encounter preferences, longitudinal data, norms, perceived crowding, trends*

Crowding and carrying capacity research has been dominated by cross-sectional studies. Researchers have modeled the impact of visitor use on the quality of the outdoor recreation experience by measuring social conditions (use levels and encounters with others), psychological conditions (evaluation of encounters and perceived crowding), and social psychological conditions (encounter expectations and preferences). From these measures, one can aggregate visitor responses into a normative standard for "appropriate" use levels that can help resource managers set visitor use policy. But, what happens if these social and psychological conditions change? If management policy is informed by cross-sectional survey research, what happens if visitor composition changes, along with individual characteristics, behaviors, expectations, and experience evaluations? Are normative standards robust enough to withstand changing social conditions and processes of individual maturation and development? Or must managers constantly monitor visitor perception, and continually adjust visitor use policy because of contingent social forces and emergent individual assessments?

This study incorporates time into an analysis of crowding and carrying capacity to investigate how change affects visitor evaluations and experiences. The analysis employed three cross-sectional surveys of boaters to the Apostle Islands National Lakeshore in Wisconsin over a 22-year period, beginning in 1975 and each administered approximately 10 years apart. The study also used a 10-year panel of 1975 visitors who returned in 1985, and a 12-year panel of 1985 visitors who returned in 1997. The goal in 1975 was to document change over time at a new National Lakeshore (established in 1970), and to control for the effects of time on the way people evaluated visitor use at an area where visitor increases were anticipated. The time-series research design can document changing normative standards used to evaluate crowding, and used by managers to establish social carrying capacities at outdoor recreation sites.

Social Change and Perceived Crowding

Density, Crowding, and Time

How has the crowding literature dealt with time? The central issue in establishing recreation carrying capacities has been to identify the influence of visitor numbers (use level) on various outcome measures. Early studies found little relationship between use level and overall satisfaction (Heberlein & Vaske, 1977; Shelby & Heberlein, 1986; Shelby & Neilsen, 1976). Consequently, research turned to on-site encounters (rather than use levels) and measures of perceived crowding (rather than overall satisfaction). The presumption is that additional encounters will make visitors feel more crowded (Shelby & Heberlein, 1986). If use level increases over time, users at an area should have more encounters with others and, therefore, feel more crowded. The results, however, from cross-sectional studies show this relationship to be modest, and the findings from the few longitudinal studies in the literature are mixed.

In the Bob Marshall Wilderness, the number of hikers grew by roughly 60% between 1970 and 1982 (Lucas, 1980, 1985). Despite increased use levels, visitors did not report more encounters (1 per day in 1970 and 1.2 per day in 1982), and felt no more crowded than visitors during the low use levels 12 years earlier. On the Brule River in Wisconsin, the number of canoeists using the river declined 50% between 1975 and 1985 (Heberlein & Vaske, 1977; Heberlein & Proudman, 1986). Consistent with decreased use levels, 1985 canoeists reported seeing fewer other parties and felt less crowded than the 1975 visitors. On the Rogue River in Oregon, use level on the river increased by 45% over a 7-year period from 6,475 people in 1977 to 9,601 people in 1984 (Shelby & Colvin, 1979; Shelby, Bregenzler, & Johnson, 1986). Perceived crowding measures in 1977, however, did not differ significantly from measures in 1984. Shindler and Shelby (1995) surveyed the same Rogue River users in 1977 and 1991. Their panel study showed that even though use of the Rogue River had almost doubled to more than 11,100 users in 1991, those who had made repeat visits to the Rogue (36%) felt no more crowded in 1991 than they did in 1977. So past longitudinal research highlights the inconsistency of the relationship between use levels, encounters, and perceived crowding across time.

Norms, Crowding, and Time

Without evidence for a linear relationship among use levels, encounters, and perceived crowding (Absher & Lee, 1981), researchers turned to the concept of norms (e.g., Manning, 1999; Shelby & Heberlein, 1986; Vaske, Donnelly, Heberlein, & Shelby, 1982; Williams, Roggenbuck & Bange, 1991). This framework assumed that perceived crowding is an expression of individual judgment and socially shared norms about "appropriate" density at a given site and at a given time. How crowded people feel depends, in part,

on the expectations and preferences they bring to a recreation site. People may feel more crowded if they expect a low number of encounters but see more people than they expected. Moreover, based on these evaluative criteria, the individual may not feel crowded or evaluate the experience negatively until visitor encounters reach some threshold number.

This normative approach, however, is problematic in cross-sectional crowding frameworks because visitors may change over time. Time related issues of change were recognized in the early 1970s during the planning stages of early carrying capacity studies (Shelby & Heberlein, 1986). At the Grand Canyon, there were concerns that the study of current visitors could not truly assess carrying capacity because past visitors, who might be more sensitive, would have been displaced. It is possible that they could have left the Canyon because use levels had increased from 500 visitors a year in the mid 1960s to over 16,000 in 1972. The "last settler syndrome" (Nielson & Endo, 1977) or "uninitiated newcomer" phenomenon (West, 1981) suggests that some newcomers to an area may have weakly defined normative expectations and preferences about an area (Roggenbuck, Williams, Bange, & Dean, 1991) and therefore will define current conditions as normal. Thus, aggregate measures of norms may change because of shifts in visitor composition over time.

Norms may also change independently of visitor composition. Cole and Stewert (2002) used a diary sampling method among Grand Canyon backpackers, and found substantial variation in individual responses to normative evaluations when measured at different backcountry zones and at different times during their trip. The product shift phenomenon suggests that people can also change their minds about standards of appropriate use given changing personal and social contexts (Shelby et al, 1988; Shindler & Shelby, 1995). The norms that they hold may change over time, and hence a relationship between encounters and perceived crowding that holds at one point in time may not hold at a second point. So, collective evaluations may also change, even while visitor characteristics remain roughly the same over time. Even though use level may be increasing, aggregate crowding levels may shift depending on a variety of broad social factors that may change the way people define appropriate uses of a recreation site. The only way to observe the potential for change, either in visitor composition or in the normative standards of visitors, is to measure social conditions and visitor evaluations at a single site over time.

Social Change at the Apostle Islands

What, then, are the forces of social change that might contribute to changes in visitor composition? How might social change affect the way visitors evaluate their outdoor recreation experiences, and change their shared normative standards about visitor use and encounters at a recreation area? In this study, we focus on the sources of change at the Apostle Islands Na-

tional Lakeshore. Established in 1970 as a National Lakeshore, the Apostle Islands have been a *developing* National Lakeshore during the time frame of this study. We focus on three areas of potential change: 1) changes in the boating industry (sales and chartering), 2) changes in visitor experience and participation at the Apostle Islands as more boaters became familiar with the area, and 3) changes in the age of the Apostle Islands boaters as the baby boom cohort became the dominant user. Each of these changes is symptomatic of broader forces of social change: 1) changes in the social structure of the region surrounding a developing National Lakeshore (Machlis & Field, 1999), 2) changes in experience and participation associated with leisure specialization and new consumer opportunities provided by the leisure and tourism industry (Urry, 1990), and 3) changes in individuals and their leisure lifestyles (Kelly, 1983).

Chartering or Owning a Boat?

At the Apostle Islands, the structure of boat ownership has changed dramatically among visitors during the 22-year period of this study. An overnight visit to the islands requires a boat, and the boat one uses can be either privately owned or chartered. The first charter company in the area (Reed's which later became Port Superior Marina) began in 1964 with a fleet of 6 boats. By 1975, this number had grown to roughly 50 boats as demand and marina capacity expanded (personal communication, Bob Holmgren, 2002). Two charter companies opened in the mid 1970s: Madeline Island Yacht Club in 1975 and Sailboats, Inc. in 1976. Superior Charters was incorporated in 1979 to revitalize the charter business out of Port Superior Marina. By 1985, these three companies had built the charter fleet to over 200 boats (personal communication, Dave Nixon, Superior Charters, 1999). At the same time, Sailboats, Inc. and Superior Charters offered sailing schools to recruit chartering customers to the Apostle Islands region.

In the 1970s, federal tax policy allowed people to treat boats as vacation property. People who purchased boats could claim an initial 10% investment tax credit, and complete depreciation over the next 5 years if the boats were rented in a charter fleet. Therefore, sales of boats boomed in the late 1970s and early 1980s as many sought tax shelters through boat ownership. The tax shelter, however, disappeared with the 1986 tax reform. With this change, the area's charter fleet decreased to just over 100 boats in 1997. This tax law change may also have contributed to the collapse of sailboat sales in 1988, when many of the major U.S. "cruising yacht" manufacturers (C&C, Pearson, Islander, Tartan, Morgan) went out of business (personal communication, Bob Holmgren, 2002). The collapse of boat sales could explain why the boats in the area's charter fleet were, on average, 9 years older in 1997 than they were in 1985. These changes in the sailing industry and in tax laws may have dramatically changed visitor composition at the Apostle Islands, and in turn changed encounter norms and the way people evaluated crowding.

Apostle Islands Boating Experience

These industry and tax changes provided a natural experiment where we have before (1975) and after (1997) measures to assess how changing boat ownership and chartering might have affected changes in the sailing experience at the Apostle Islands. Prior to these changes in the late 1980s, the growth of the chartering business (and sailing schools) may have attracted more novice visitors less familiar with the Apostle Islands who wanted to give the activity and the destination a try. These new users may have been unfamiliar with the variety of destinations, how they should navigate there, and where to anchor safely once they arrived. Consequently, they may not have had well-formed encounter expectations and preferences, and may have even preferred the higher use destinations, with more people around in case of emergencies (Donnelly, Vaske, & Graefe 1986). Likewise the tax benefit of boat ownership may have encouraged a less committed boat owner interested more in the investment value than in developing sailing skills.

After the tax incentive went away, the charter fleet at the Apostle Islands declined along with the ratio of charterers. And without the tax incentive, the boat owner in the 1990s may have been the more committed sailor, willing to make more substantial investments in time and money to justify boat ownership. A higher proportion of boat owners at the Apostle Islands during this time could contribute to changes in encounter norms and levels of perceived crowding. Vaske, Donnelly, and Heberlein (1980) found in the 1975 data that those with more years experience at the Apostle Islands evaluated their encounters more negatively and felt more crowded. Also, Kuentzel and Heberlein (1992) found among the 1975-1985 panel that those with more experience avoided the more crowded islands and found more remote anchoring sites. Consequently, in 1997 after the chartering industry had declined, we would expect a higher percentage of boat owners to have more experience with the islands, and therefore to either spread use around the islands or to feel more crowded.

An Aging Population

The age structure of the Apostle Islands population may also have changed during the 22-year period. When first sampling at the Apostle Islands, respondents were more likely to be from the depression and World War II age cohort. The baby boom cohort—the single largest “aberration” in demographic history—was just entering the work force and was not yet the economic force it became in the 1980s and 1990s. It could be that the younger baby-boom cohort drove the increase in chartering at the Apostle Islands, having later purchased boats once they were further along in the career development process. So the age structure of Apostle Islands boaters has likely changed, and in turn the experiences of different age cohorts may have had an effect on the encounter norms held by each group and an effect on the way they evaluate use levels. This changing age structure may also have affected crowding independently of changing boat ownership and boating experience. Shifts in the age structure may instead reflect changes

brought about by the social standards of age cohorts with shared life experiences and perspectives.

In sum, this study examines the effects of time on encounter norms and crowding perceptions at the Apostle Islands National Lakeshore. If these aggregate evaluations changed over time, then recreation carrying capacities based on cross-sectional measures of norms may be problematic, particularly when the forces of change lie outside management control. This study therefore uses a longitudinal analysis to document change and/or stability in encounter norms and crowding perceptions, and to explore how social changes (boat industry and age cohort) and individual changes (Apostle Islands experience, frequency of participation, and encounters) may explain variation in aggregate encounter norms and perceived crowding among boaters. The goal is to understand what happens to encounter norms and evaluations about crowding when things change over time.

Methods

The Apostle Islands National Lakeshore includes 21 islands on the northern tip of Wisconsin within roughly a 250-mile² area of Lake Superior. The largest island in the archipelago is Stockton Island, at 15.7-miles² (4069 hectares), while the smallest island is Gull Island, at roughly 3.35 acres (1.4 hectares). The Islands are covered by northern boreal forest, and the sandstone cliffs lining the shore are interspersed with long sandy beaches with numerous shallow bays. Boaters, who travel primarily in sailboats, power boats, and sea kayaks (since the mid-1980s), move at various paces among the islands. When not moving across the water, boaters stop to sunbathe or beach comb on a deserted beach, visit historic sites (light houses, fishing camps, logging camps, quarries), participate in National Park Service interpretive programs, hike trails on the islands, visit sea caves, or picnic on the islands. At night, they may choose to anchor in a protected bay, tie to a Park Service dock, or camp at a designated campsite on one of the islands.

Sampling

The Apostle Islands National Lakeshore presents a logistical challenge for researchers gathering a representative sample of overnight visitors to the area. Exit surveys are not feasible because there are too many boat landings and marinas on the South Shore of Lake Superior. Instead, onsite contacts were used either at National Park Service docks throughout the Islands or at overnight anchoring locations. Positioning field staff on the Islands, however, presents many challenges. High seas, fog, Lake Superior storms, and boat maintenance problems create uncertain access to, or exit from the Islands, which can alter sampling schedules and leave some islands under-sampled.

1975 sampling. The 1975 sampling strategy used visitor contact cards, asking for names and addresses of all boaters, campers, and day visitors who visited between June and November. Self-registration stands were used at two

locations on Stockton Island (Presque Isle Bay and Quarry Bay), which received nearly 90% of the overnight use at the Apostle Islands in 1975. Observation showed that only two in five boaters used the self-registration system, however, so Bayfield area marinas were asked to furnish the names and addresses of people who had rented boats or boat slips from them. Three (Apostle Islands Marina, Madeline Island, and the Apostle Island Yacht Club) of the four marinas¹ that existed at the time provided boaters' addresses. These individuals were mailed a set of visitor contact cards to identify themselves and anyone else on board with them during the 1975 season. The goal of these two procedures was to generate a near census of 1975 visitors to the Apostle Islands. Heberlein and Vaske (1979) acknowledge this goal is not possible given the geography of the area. Some boaters travel to the area from more distant marinas on Lake Superior, and others tow their boats to area landings and never use local marinas. Nevertheless, it is likely that a portion of those missed in the marina sampling strategy were included in the Stockton Island self-registration procedure.

These two procedures produced 2,253 visitor contact cards from the 1975 population of private boaters, campers, and excursion boat passengers. Seventy-seven percent of these were overnight boaters, so we identified over 1,700 persons who reported staying overnight at the islands. During the summer of 1975, the Park Service identified 7,050 boater overnight stays at the islands. Assuming that the average stay is between 2 and 3 nights, these 1,700 people probably represent more than half of the 1975 visitors. Moreover, based on this sample, our 1975 use level estimates were within 15% of the estimates made by the Wisconsin Department of Natural Resources with their 1975 flyover statistics (Heberlein and Vaske, 1979).

From the list of 2,253 names gathered, a systematic random sample of 1,200 visitors was selected to receive a 16-page mailed questionnaire. From this sample, 847 people returned useable surveys, 56 were undeliverable, and 70 were returned blank. Excluding the undeliverable questionnaires, the response rate was 74%. Out of the 847 responses, 648 were boaters, 149 were campers, and 50 were day visitors from the excursion boat. The current study included only boaters.

1985 sampling. In 1985, field interviewers gathered a sample of overnight boaters only, and did not gather information from campers or day users, as in 1975. Sampling involved a 2-step process. First, aircraft flights over the islands on 27 randomly selected days in 1981 and National Park Service records showed that the majority of overnight use of the Islands (almost 90%) had spread to 5 locations: 1) Presque Isle Bay on Stockton Island, 2) Quarry Bay on Stockton Island, 3) Rocky/South Twin Islands, 4) Oak Island, and 5) Raspberry Island. To sample overnight visitors, field interviewers were transported to each of the 5 locations, set up in campsites,

¹Port Superior Marina did not provide names. Because Port Superior was the largest marina with 172 slips, our mailed requests covered only 62% of all the slips in the Bayfield area.

provided with a personal water craft (dinghy or canoe) to approach moored boats, and asked to gather the names and addresses of all boaters docked or anchored overnight at that island. Second, the sampling plan also considered high use seasons and shoulder seasons. Using past National Park Service visitation records, the peak season was from July 3rd to August 20th, and the off-peak season was from May 1st to July 2nd and August 21st to October 31st. A team of interviewers therefore made four trips to the islands during the summer, two during the peak season and two during the off-peak seasons. This strategy called for a total of 15 days at each island where field workers gathered names and addresses of all boaters anchored or docked overnight. These 15 days covered both high-use days (Friday and Saturday) and low-use days (Sunday through Thursday). This methodology produced 1,217 visitor contact cards for the 1985 season. A sample of 500 boaters from this list was selected proportionate to actual overnight use during the 1985 season, based on National Park Service counts. For example, according to National Park Service counts, 38% of the 1985 overnight stays occurred at Presque Isle Bay; 21% of the 1985 stays were during the on-peak season and 17% during the off-peak season. The sample of 500 was therefore selected proportionate to these percentages for each of the five sampling locations. Each person selected was sent a 33-page questionnaire. From this group, 377 people returned surveys for a 75% response rate.

1997 sampling². Sampling in 1997 was similar to 1985, but because we had access to a Sea Grant Research vessel to transport field workers to the islands, there was more latitude in the selection of sampling days. This wave of the study employed a 3-step sampling procedure. First, we sampled proportionate to overnight use. The Park Service's 1996 overnight boater counts showed that 93% of the overnight visits were recorded at six locations: the same five as in 1985 plus Sand Island, which had seen an increase in overnight use during the 1990s. Each Island was sampled proportionate to use from 1996 visitation records. For example, Stockton Island (Presque Isle Bay and Quarry Bay) received 55% of all 1996 overnight visits, so field workers sampled at this location for 55% of the sampling days. While in 1985, each island was sampled at the same time on four different trips, we randomly selected different dates for each island in 1997 so that at least one person was on at least one island throughout much of the summer. Second, we sampled based on peak season and off-peak seasons, as in 1985. The peak season included July and August (75% of the 1996 visits), while the off-peak season included June and September (25% of the 1996 visits). Third, we

²The time interval between the 2nd and 3rd study was 12 years (1985 to 1997) rather than 10 years (1975 to 1985) because of delays in the grant review process. Because this study is not funded by an ongoing research program, the researchers must submit separate grant proposals for each wave of the project, and the most recent submission took longer than we hoped. However, there is nothing "magic" about a 10-year interval, and the magnitude of change that can occur in 10 years should differ little from the magnitude of change that can occur in 12 years.

sampling proportionate to weekend days (Friday and Saturday nights) and week days (Sunday through Thursday nights) in both the off-peak and peak seasons. Using 1996 Park Service visitation records, the stratification criteria in the off-peak season allocated approximately 41% of the sampling days to weekdays and 59% of the sampling days to weekend days. In the high-use season, we established a nearly equal number of sampling days on weekdays (48%) and weekend days (52%). The sampling procedures employed in this study yielded a sampling frame of 1,802 boaters during the 1997 season. We selected 560 people to receive a 32-page questionnaire. As in 1985, this sample was proportionate to actual 1997 visitation (NPS visitor counts) stratified by the islands visited, and by peak-season and off-peak season use. From this group, 389 people returned surveys for a 69% response rate.

Tracking the 1975 panel and the 1985 panel. This study also used data from two panels of Apostle Islands boaters. Each cross section questionnaire asked respondents to include the names of 2 close friends or family members who might know the respondent's whereabouts in the future. In 1985, researchers attempted to relocate the 1975 respondents by sending a letter to the respondent's old address, asking them to confirm that they still lived in the same place 10 years later. If there was no reply, or if the letter was undeliverable, then letters were sent to the friends listed 10 years earlier. From these efforts, 501 of the original 648 people in the 1975 survey were located (77.3%). Of this group, 397 people (79.2%) completed and returned questionnaires. Of the original 648 boaters, 61.3% filled out both the 1975 and the 1985 follow up questionnaires.

In 1997, researchers attempted to locate members of the 1985 cross-section using CD-ROM phone directories and internet search engines. Where there were multiple listings for the same name, or the identity of a person was uncertain, research assistants followed up by phone calls to confirm the identities. When computer technologies proved unsuccessful, they then resorted to letters to friends listed on the 1985 questionnaires. Using these techniques, we were able to find 327 out of the original 377 (86.7%). After sending a follow-up questionnaire, 160 people (48.9%) returned useable surveys. Of the original 500 boaters in the 1985 cross section, 32.0% filled out both the 1985 and 1997 follow up questionnaires.

Weighting

While the 1975 data was a simple random sample of the Apostle Islands boater population, the 1985 and 1997 sampling design employed a stratified random sample that was proportionate to the distribution of boat overnight stays at each island, weekday/weekend days, and off-peak and peak seasons. Boat overnight stays in an on-site sampling scheme, however, are complicated by a boater's length of stay. Boaters spending more days in the Islands had a higher probability of selection than those spending fewer days. Therefore, we compensated for sampling bias in the latter 2 cross sections by weighting each boater in inverse proportion to the number of days spent in the Islands.

For example, a boater spending 10 days in the area received a relative weight one-fifth as large as a boater spending only 2 days. Respondent weights were created using the following formula:

$$\text{Weight} = (WD * N) / W$$

where $WD = 1$ divided by the number of days spent in the islands, $W =$ the sum of all respondent's WD measure, and $N =$ the sample size.

Measurement

Dependent variable. All variables in the analysis were measured with items that were identical in the 1975, 1985 and 1997 questionnaires. We measured perceived crowding with a 1975 index measure that was created before the 9-point single item measure developed by Heberlein and Vaske for research on the Brule River in Wisconsin (Heberlein and Vaske 1977) became the convention (Shelby, Vaske, & Heberlein 1989). The index measure of perceived crowding at the Apostle Islands included four summed items. Each of the 4 items used a 5-point Likert-type scale from strongly disagree to strongly agree: 1) The places we stopped were often too crowded, 2) I think we met too many people during our trip, 3) It bothered me to see so many people using the Islands, and 4) It bothered me more people were not using the Islands (reverse coded). The summed items created an index measure that ranged from 5 (least crowded) to 20 (most crowded). Cronbach's alpha coefficient was .66 for the 1975 data, .69 for the 1985 data, and .66 for the 1997 data.

Independent variables. The analysis controlled for the exogenous effects of time by coding the year (1975, 1985, 1997) in which each individual was first sampled. Next, chartering was measured by self report. If respondents used a boat that was chartered, they were coded 1. If they were on their own boat or a guest with an owner, they were coded 0. Age was assessed by asking respondents what year they were born. The analysis used 2 indicators to measure respondents' experience and participation. To measure the respondents' Apostle Islands experience, the questionnaire asked: "Prior to the (1975/1985/1997) season, how often have you boated among the Islands?" The questionnaire provided 12 options ranging from "My first visit was in (1975/1985/1997)" to "More than 30 visits prior to (1975/1985/1997)." To measure the number of days boated at the Apostle Islands, respondents were presented with a calendar for each month from May through October and asked to circle the days they boated at the Islands. The number of days they circled was then totaled.

Next we measured the normative component of encounters by asking respondents to think about the single island that they anchored or docked at for the longest time. The questionnaire then asked: "Before you arrived on the island, how many other boating parties did you prefer to see docked or anchored at the same island?" Respondents were given 10 response options from "0 boats" to "more than 20 boats." They were also allowed to say

they had no preferences for boater contacts. The questionnaire then measured encounters by asking respondents about contacts while anchored. Measuring on-the-water contacts would be difficult since other boaters can be seen from several miles away, and for many this may not constitute an encounter. The survey therefore asked, "On your best trip, what was the greatest number of boats you saw docked and anchored at the island at which you were moored for the longest period of time." Respondents were given 10 response options from "0 boats" to "more than 20 boats."

Boaters were asked to think about their "best trip" because the questionnaire asked them to recall detailed information about where they went, what they did, and what they thought about the experience. Because most respondents were filling out the questionnaire 6 to 8 months after the fact, they would be more likely to recall details from the best trip. The majority of boaters (55.4%) only made one trip, and reported on that single experience. It is possible that those who took multiple trips reported on trips where they were least crowded, depressing the aggregate crowding scores. However, when comparing the two groups, those who took multiple trips reported more encounters and felt more crowded on their single best trip than those who took only one trip. Therefore it is unlikely that reporting on the "single best trip" introduced measurement bias into the model.

Analysis

In analyzing data for this study, we merged the 3 cross-sections into a single data set. We also merged panel data from 1975 and 1985 into a single data set, and panel data from 1985 and 1997 into a separate single data set. We then analyzed change at the Apostle Islands across the 22-year period by using one-way analysis of variance and Duncan range tests to explore differences between the means for each of the 3 samples. We then used Ordinary Least Squares (OLS) Regression to build path models. We recognize that one of the variables in the model is dichotomous and therefore violates the assumptions of OLS regression. Nevertheless, the coefficients were robust and compared closely with the coefficients from a Maximum Likelihood technique in the AMOS structural equation software package. However, we chose to report the results in OLS because AMOS does not easily accommodate weighted data.

Results

Perceived Crowding and Encounter Norms

Use Levels and Perceived Crowding. From 1975 to 1985, use level more than doubled from 7,050 to 15,051 overnight visitors (Table 1). The number of encounters increased accordingly from over 6 to over 8 encounters on the single best trip. But in spite of more use and more encounters, 1985 visitors felt less crowded than 1975 visitors. Between 1985 and 1997, use level increased modestly to 17,615 overnight visitors. This 17% increase was much

TABLE 1
Indicators of Change across the 3 Samples of Apostle Island Boaters

	1975	1985	1997	F
<i>Change in use levels and perceived crowding</i>				
Total boater nights during the year	7,050	15,051	17,615	na
Number of encounters while anchored	6.19 _a	8.45 _b	9.61 _c	50.49*
Perceived crowding	10.68 _a	9.64 _b	10.53 _a	17.13*
<i>Change in individual indicators</i>				
Preferred Number of Encounters	5.70 _a	12.03 _b	12.43 _b	60.14*
% who felt encounters were "too many"	30.7 _a	19.4 _b	18.5 _b	13.56*
Chartered a boat (percent)	39% _a	73% _b	56% _c	58.85*
Age (years)	37 _a	36 _a	44 _b	57.64*
Years of Apostle Islands Experience	3.95 _a	4.78 _a	9.02 _b	75.43*
Number of Days Boated	4.93 _a	4.85 _a	6.27 _b	5.74*

Note—Entries with different subscripts reflect comparisons by rows, and are significantly different at the $p < .05$ level using Duncan range tests.

*— p is significant at less than the .01 level

less than the doubling that occurred during the first period, and National Park Service visitation statistics show the trend to be relatively flat after the number spiked in 1987. The average number of contacts at mooring sites increased by roughly the same percentage as total visitation, moving from 8.45 in 1985 to 9.61 in 1997. The 1997 perceived crowding levels increased to 1975 levels. With twice as many boaters, the 1997 boaters felt no more crowded than the 1975 boaters, when use level was 7,050 overnight visitors.

Encounter preferences. Between 1975 and 1985, the encounter norm changed dramatically. The preferred number of other boats that visitors wanted to anchor with went from 5.70 boats per night to 12.03 boats (Table 1). This encounter norm then remained stable between 1985 and 1997. The magnitude of this change is detailed in Figure 1. Thirty five percent of the 1975 boaters preferred to moor alone. This dropped to 17.8% in 1985, and declined further to 14.1% in 1997. The percentage who said they had no preference was 12.7 percent in 1975 and increased to 28.4 percent in 1985 and stayed stable in 1997.

Since the sampling procedures changed between 1975 and 1985, we wanted to look for evidence to corroborate the dramatic norm change shown in Figure 1 by analyzing a second measure of norms. Respondents in all three studies were asked what they thought about the number of other boats they anchored with on their single best trip. Was the number "too few," "about right," or "too many?" Changes in these evaluations followed the same pattern as changes in encounter preferences (Table 1). In 1975, 30.7% said their actual encounters were "too many," while only 19.4% of the 1985 boaters said the encounters were "too many," even though the number of

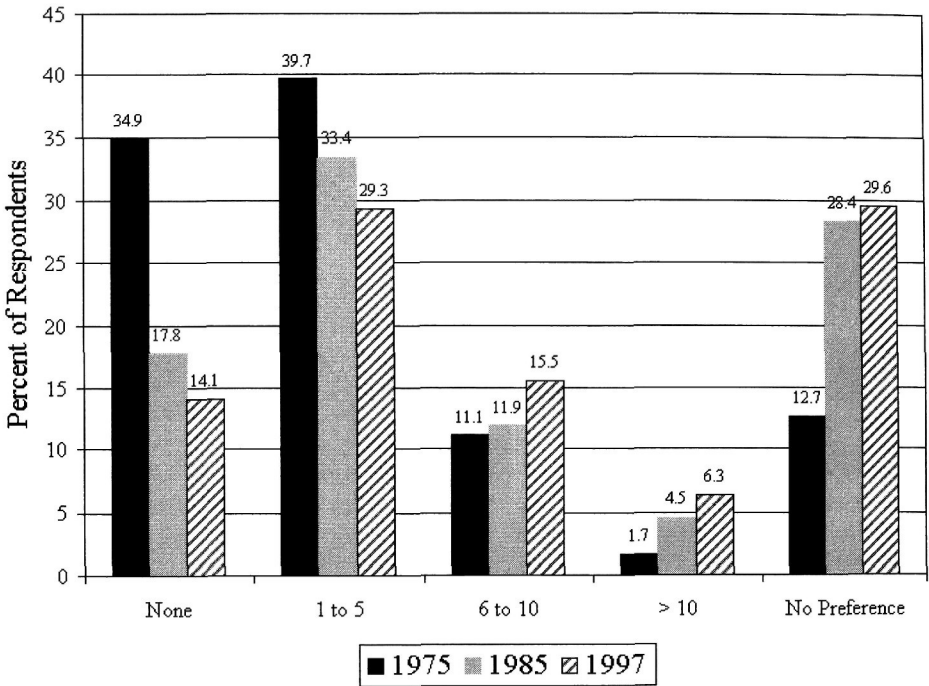


Figure 1. Encounter preferences at the Apostle Islands National Lakeshore for 1975, 1985, and 1997.

boaters had doubled between 1975 and 1985. This alternative measure of a crowding norm also did not change between 1985 and 1997. In 1985, 19.4% of the boaters said their encounters were “too many,” while 18.5% of the 1997 boaters felt this way.

We also examined data from the panel studies to see if encounter norms changed (or remained stable) among the same individuals over time. There were 110 people from the 1975 cross-section who returned to make an Apostle Island trip in 1985 and who answered the second wave survey. Their encounter preference norm averaged 5.71 boats in 1975, but the encounter norm among the same group of individuals had increased to 10.1 boats in 1985. There were also 28 people from the 1985 cross-section who made return trips to the Apostle Islands in 1997. Their encounter preference norm averaged 10.1 boats in 1985, and had remained roughly the same at 11.8 boats in 1997. These two tests (an alternative measure of norms and panel responses to encounter preferences) mirrored the encounter norm results and suggests that norm change between 1975 and 1985 was not the result of sampling bias.

Increases in Chartering, Age and Experience

The results showed substantial forces of social change at the Apostle Islands. Chartering was the bellwether of change between 1975 and 1985, while age and Apostle Islands experience were the bellwethers of change between 1985 and 1997. The proportion of charterers vs. boat owners followed changes in the area's chartering industry increasing from 39% in 1975 to 73% in 1985 (Table 1) as the charter fleet increased. When the tax incentive went away in 1986, and the charter fleet halved, the percentage of charterers decreased to 56% in 1997. Between 1975 and 1985 the average age of boaters was stable, in spite of the influx of baby boom boaters. However, the average age of boaters increased dramatically from 36 years old in 1985 to 44 in 1997. These 1997 boaters were more experienced with 9 years of Apostle Islands boating experience as opposed to 5 years for the 1985 boaters. The 1997 boaters also spent more days boating in the Apostle Islands (just over 6 days) than the 1985 boaters (just under 5 days).

How did Changes in Chartering Influence Encounters, Norms, and Crowding?

Substantial changes in chartering over the 22-year period, however, had only a limited and indirect effect on crowding at the Apostle Islands (Figure 2 and Figure 3). In both periods, there was no direct effect of chartering on encounters. The charterers also did not prefer more encounters with others.

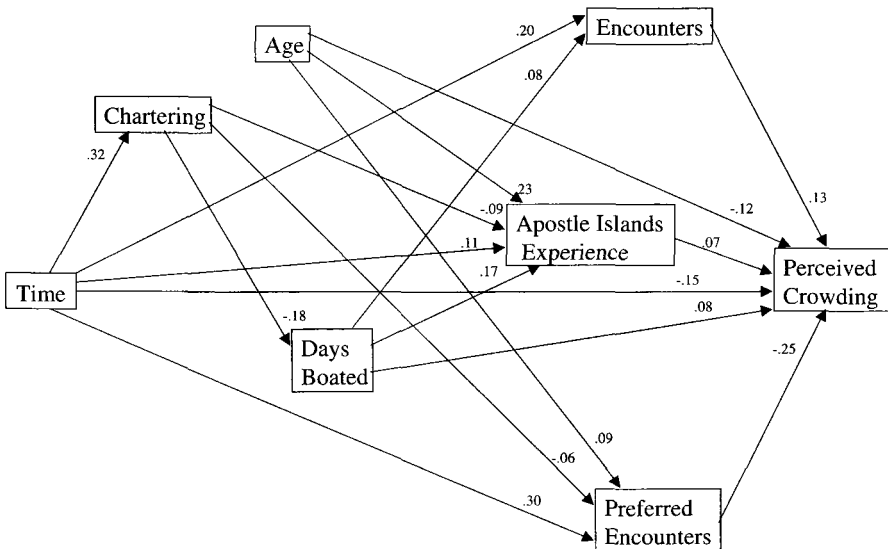


Figure 2. Standardized regression coefficients (Beta) for 1975-1985 Apostle Islands boater model. ($F = 20.29$, $df = 7$, $p < .001$, $r^2 = .13$.)

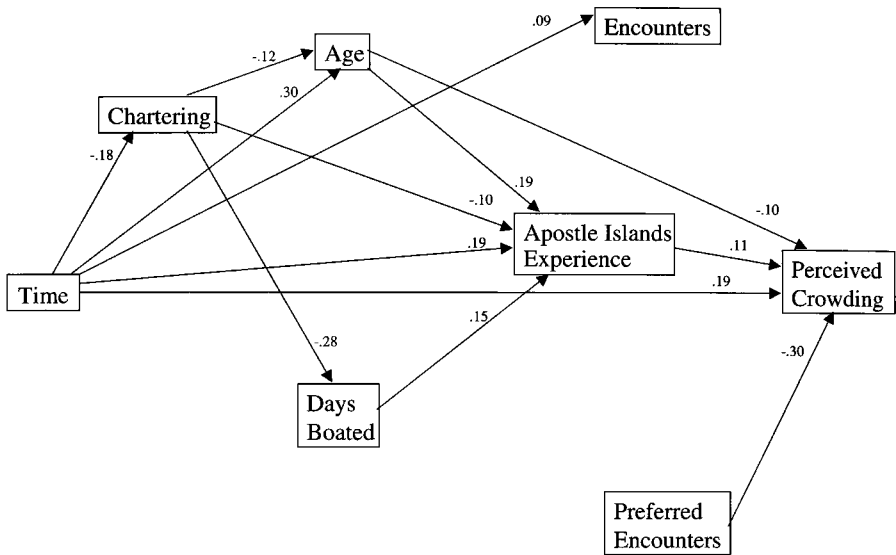


Figure 3. Standardized regression coefficients (Beta) for 1985-1997 Apostle Islands boater model. ($F = 13.42$, $df = 7$, $p < .001$, $r^2 = .13$.)

Instead, they preferred slightly fewer encounters (Beta = $-.06$) in the 1975-1985 model (Figure 2), and had the same preferences for contacts in the 1985-1997 model (Figure 3). Finally, there was no direct effect of chartering on perceived crowding across the 22-year period. Rather, the effects of chartering were indirect. The charterers boated fewer days and had less experience in both models. Visitors with less experience (owners as well as charterers) felt less crowded in both models, and visitors who boated fewer days also felt less crowded in the 1975 to 1985 model. So the 1985 increase in chartering meant there was an increase in novice boaters at the Apostle Islands who boated for fewer days, and who felt somewhat less crowded.

How did Changes in Age Influence Encounters, Norms, and Crowding?

The dramatic increase in the average age of boaters in 1997 had little effect on encounter norms or perceived crowding. In both models (Figure 2 and 3), age had a direct negative effect on crowding: controlling for other variables in the model, older boaters felt *less* crowded. However, this was offset by the tendency for older boaters to spend more days boating and to have more years of experience at the Apostle Islands. Boaters with more experience and who boated more days on average felt less crowded. Taken together, this finding explains why the zero order correlations with age and crowding in both periods are not significant. Thus, age stability between 1975 and 1985 cannot explain the increase in encounter preferences and the decrease in perceived crowding. Neither can the increase in age between 1985

and 1997 explain the stability in encounter norms and the stability of crowding during the second period.

Why Did Visitors Feel Less Crowded in 1985?

The increase in chartering and attendant reduction in experience explains only a small part of the decrease in crowding between 1975 and 1985 (Figure 2). The dramatic change in norms over the period (Figure 1) explains much more of the variance in crowding (Beta = $-.25$). Visitors felt less crowded in 1985 in spite of more contacts (Beta = $.13$) because they were more tolerant of contacts. But there is more to it than that. A notable coefficient predicting perceived crowding was the direct effect of time (Beta = $-.15$). After all of the variables were entered in the model there was still a direct effect of time on crowding. There were changes occurring over time outside of the variables in this model that decreased crowding in 1985. We conducted several tests with variables that might "explain" this relationship including education, income, residence, group composition, boat ownership, and various boating motivations. In every case, the direct negative effect of time remained significant. So we are left to conclude that some sort of social, personal, or environmental change reduced the perception of crowding in 1985 net of changes in chartering, experience, encounters, and preferences for encounters, but we cannot identify the exact cause.

Why Did Visitors Feel More Crowded in 1997?

A small part of the increase in crowding is due to the increasing age and decreasing chartering which increased experience. The more experienced boaters tended to be more crowded (Beta = $.11$), and age and chartering have an indirect effect through experience (Figure 3). Some of the effect of age through experience is offset by the direct negative effect of age (Beta = $-.10$), which was observed in the earlier period as well. The two key variables usually associated with crowding cannot explain the change in the current model. Encounters did increase over time, but they had no effect on perceived crowding. Preferred encounters had a large effect on crowding (Beta = $-.30$) as it did during the first period, but the norm itself did not change between 1985 and 1997 (Figure 1), so this cannot explain the change in perceived crowding. As in the earlier period there is a strong effect of time (Beta = $.19$) unexplained by the other variables. But unlike the earlier period, now the coefficient between year and crowding is *positive rather than negative*. Between 1985 and 1997 visitors became more, rather than less crowded. All we can report from the estimation of these models is that time is important, but sometimes it is associated with decreases in crowding (1975-85), and other times it is associated with increases in perceived crowding (1985-97). The influence of time is not "explained" by structural changes such as changes in chartering, changes in age, changes in experience, or increases and decreases in norms or contacts in either time period.

Discussion

Encounter Norms

The encounter norm changed dramatically at the Apostle Islands between 1975 and 1985 and then stabilized between 1985 and 1997. Between 1975 and 1985, there was a "product shift" (Shindler & Shelby, 1995), where preferences for contacts increased and perceived crowding decreased, in spite of increases in use levels. This norm change was observed among both the 1975 and 1985 cross sections, and among panel individuals who visited the Apostle Islands in both years. During this time, sub-groups of boaters held different encounter norms. Charterers preferred fewer encounters than boat owners, and older people preferred more encounters than younger people. Between 1985 and 1997, the encounter norm remained the same. This stability was observed in both the 1985 and 1997 cross sections, and among panel individuals who visited in both years. During this time, the encounter norms of different sub-groups had converged. Boat owner norms also were no different from charterer norms, and the norms of older people were no different from the norms of younger people. Why did this standard change during the first interval (1975 to 1985), and then stabilize in the second (1985 to 1997), even though perceived crowding increased during the latter interval? Moreover, what do these findings mean for using cross-sectional measures of encounter norms to establish carrying capacities at recreation destinations?

There are at least two ways of thinking about these changes. On the one hand, there is evidence to suggest encounter norms simply follow use levels, where people use on-site density cues to evaluate standards of appropriate use (Cole & Stewert, 2002). On the other hand, there is also evidence that encounter norms are tied to developing social representations (Farr & Moscovici, 1984; Pearce, Moscardo, & Ross, 1996) of leisure activities at specific locations. Supported by changes in the administration of the area (National Park Service) and changes in the boat industry, the "boat culture" of the Apostle Islands area may have changed from a traditional sailor seeking Lake Superior solitude, to a yacht charterer seeking a unique holiday experience, to a contemporary boat owner seeking performance sailing. This dynamic cluster of changes may affect the way users define appropriate standards of use.

Use level cues? Did encounter norms at the Apostle Islands simply follow use levels, and reflect generalized standards about density observed at recreational areas (Cole & Stewert, 2002)? The results showed that as use levels increased, boaters became more tolerant of encounters, preferring about what they saw. This change was observed not only in the 1985 boaters compared to the 1975 boaters, but also among the 1975 boaters who were still visiting the Apostle Islands in 1985. It may also be that the reason we saw no change in encounter preferences between 1985 and 1997 is because use level changed modestly, and remained relatively stable after 1987. Given the rel-

actively constant numbers of visitors, the preferences for encounters remained about the same. If this finding can be generalized to other locations, the use of normative standards to establish carrying capacities is problematic. If encounter preference trends simply follow use level trends, then a cross-sectional norm, which represents one point of a dynamic trend, may be a poor criterion for establishing recreational carrying capacities and use limits. Encounter norms measured at one point in time may not reflect the actual threshold of use at a given site. Without measuring normative standards across time, managers cannot empirically rule out the possibility that a site can successfully accommodate more people at some future time. If more people can be accommodated, then physical and biological criteria become more viable than visitor preferences and evaluative standards in establishing recreation carrying capacities.

Social representations? On the other hand, what we have observed at the Apostle Islands may be a process of social representations in transition (Farr & Moscovici, 1984; Pearce et al, 1996). The area, as a National Park, was still relatively "young" between 1975 and 1985, and the big marinas that facilitated a developing charter industry were not completed until 1979. People during this time were learning about access to the area (boat landings, marinas, chartering options, sailing schools), about Park Service facilities on the Islands (trails and interpretive programs), and about anchoring options (Raspberry Island, Justice Bay, Oak Island, etc.). In this discovery and development phase, boater preferences for encounters were probably not yet well defined. In this state of transition, the 1985 boaters who were mostly younger charterers preferred to anchor with more boats than 1975 boaters, who expected a lower density boating experience. This helped people feel less crowded even as encounters increased into the 1980s. By 1985, the norm probably had stabilized, and then was sustained over the next 12 years, in spite of changes in the boat industry. Consequently, it could be that norms change when the institutional or structural conditions (NPS management and the boat industry) of an area change the fundamental ways people think about, and engage in an activity. That is, when recreation behavior is changed by an evolving management and service infrastructure, the representation of the activity changes and social psychological evaluations follow. After a period of establishment in the case of the Apostle Islands, or following a stage of structural transition, normative standards may become more stable as the system stabilizes. If so, carrying capacities based on encounter norms offer a viable way to manage recreational use, but managers should be particularly attentive to social change and its influence on the development of a recreation site and its "product stage."

Has the norm really stabilized? Has the Apostle Islands boating experience become firmly institutionalized as a commonly held social representation among visitors? Or will future social changes bring change to the boating experience and the way visitors evaluate that experience? A fourth wave of data collection will be necessary to sort out this "product shift" issue of norm change and stability. There is evidence that boater use level at the

Apostle Islands is growing again since 1997. A new marina was built in Pikes Bay next to Port Superior, and the number of slips in the area has increased 17% since 1997. Park Service use figures also show an increase in boater overnights. If the norm has stabilized, we would expect the encounter preferences to remain the same (a preference to anchor with 12 other boats), and boaters in 2007 to feel more crowded with the likelihood of increasing use and increased encounters. If the norm changes again in 2007, then encounter preferences should either follow use levels, or should be affected by changes in the structural conditions at the site or changes in the way people think about, and participate in boating. With this longitudinal design, we will be in a better position to evaluate which explanation has more credibility.

Perceived Crowding

As expected, encounter preferences had the strongest effect on perceived crowding in both path models (Figure 2 and 3). Those who preferred more encounters felt less crowded throughout the 22-year period. This relationship explains why 1985 boaters felt less crowded than 1975 boaters, even though use levels had dramatically increased. The 1985 boaters had changed their norms. Their higher encounter preferences were consistent with the increased encounters that come with increased use of the Apostle Islands. Yet, this relationship was not as clear during the 1985 to 1997 interval. Encounter norms were the same for 1985 and 1997 boaters, yet the 1997 boaters felt more crowded. And even though the 1997 boater had slightly more encounters than the 1985 boater, there was no direct effect of encounters in the model (Figure 3). This finding also presents problems for managers using a normative framework for establishing recreation carrying capacities. Norm stability and relatively stable use levels do not ensure stability in perceived crowding. These data show that perceived crowding is subject to a number of other factors besides use levels, encounters, and visitor evaluations about those encounters.

Changes in chartering. The increase in chartering shows that structural factors outside the system (e.g., tax laws) can have a substantial effect on visitor numbers and their composition. What did that mean for crowding? The results from the two path models showed little effect. Visitors on charter boats were less experienced and boated fewer days. This played some role in reducing the level of crowding in 1985. They were younger as well as less experienced in 1997 and fewer in number, which explains part of the increased crowding in 1997. But in many ways they were just like the boat owners. They had the same crowding norm in the 1985-1997 model: They were equally tolerant of contacts, they did not go to the places where they would see more boats, and did not feel less crowded net of the experience variables. Overall, changes in the chartering industry at the Apostle Islands were not sufficient to explain the changes in norms or crowding over time.

Changes in age and experience. Why did the age of Apostle Islands boaters change so dramatically from 1985 to 1997? The path model showed that this increase in age was partially due to the decrease in chartering. Charterers

were younger in 1997 than boat owners, and because chartering declined, the area was attracting an increasing number of older boat owners. It could also be that boat ownership in the 1990s required an older individual, further along in the career development process, and with more developed financial resources. Without the tax incentive in the 1980s, boat owners in the 1985-1997 period needed more money to purchase, maintain, and store a boat capable of navigating Lake Superior waters.

Figure 3 also suggests that Apostle Islands boat owners may be growing older with their boats. The decline of boat sales and the increasing age of the charter fleet may also mean that fewer people in the 1990s are being recruited into sailing as a leisure activity. The increase in Apostle Island experience suggests that repeat visitation is up, so there could be a higher proportion of boat owners who are renting the same marina slip year after year, and developing more knowledge about, and commitment to the Apostle Islands as a boating and vacation destination. The lifestyle demands of owning a boat also may be affecting the age and experience of contemporary Apostle Islands boaters. Belonging to the area's "boat culture" requires more than just a financial investment. Ownership can significantly structure and restructure one's leisure time and commitments, one's social networks, and one's psychological attachment to being a boater. Becoming a "competent" member of that "culture" requires time, and may be closely implicated in the process of growing older with one's boat.

What does this mean for perceived crowding? The late 1980s and the 1990s saw a maturing population of boaters—maturing not only in age and experience, but also likely maturing in their knowledge of, and commitment to boating at the Apostle Islands. Therefore, the increase in repeat visitations, which creates a more committed and somewhat older visitor, may contribute to stabilized normative standards, and may make visitors report higher levels of crowding even given modest increases in use levels and encounters. The development of the local "boat culture" may also stabilize normative standards and make people more sensitive to the presence of others. Nevertheless, these changes in visitor composition were not sufficient to account for all the change over time in boaters' evaluations of perceived crowding.

Unexplained effects of time. Our analysis showed that there were exogenous effects of time on perceived crowding. Modeling social and individual changes among Apostle Islands boaters could not remove the direct effect of time (1975, 1985, or 1997) on perceived crowding. Changes in chartering, age, and experience each had direct and indirect effects on encounter norms and perceived crowding. Yet, these events were not sufficient to explain all of the change that occurred in perceived crowding over time. This means that social forces other than the ones we included in the model were changing and visitor evaluations about crowding. What were potential explanations left out of the model? Was it changing attitudes about leisure and leisure time? Was it changing perceptions about wilderness and wilderness degradation? Could the change be a function of social dynamics: the presence or lack of "old timers" in the area who act as guardians of local standards or nodes of communication and social networks between boaters?

Conclusion

One cannot assume, without first surveying visitors, that increased use level will lead to more crowding. If the norms change then increased numbers can be tolerated. Many questions remain, however, about the process of norm change. Do norms simply follow use levels or do they go through some sort of structural development as a new activity is introduced and matures? Norm change also could not be fully explained by changes in visitor composition. Our data show that new types of users (charterers vs. boat owners) did not account for the dramatic change in norms observed during the first 10-year period. Norms then remained stable in the second interval in spite of an aging boater population and an increased percentage of boat owners. So, is norm change, and stability, a function of societal or institutional trends, or is it more a function of the situational and contextual dispositions of individuals?

The norm framework in recreation research has received ongoing critical scrutiny as a management tool (Roggenbuck et al, 1991; Stewart & Cole, 2001; Cole & Stewart, 2002), and we believe that an understanding of when and how norms change among visitor populations is central to the objections raised. Our experience further suggests that managers and researchers need to be skeptical about establishing carrying capacities based on crowding using cross sectional data only. Adaptive management requires monitoring of both norms and perceived crowding over time. We encourage others who have collected data on norms and crowding in the past to revisit these sites and collect new data on current visitors which might help understand norm change and stability, and inform this paradox of less crowding with more visitors, and more crowding with stable numbers of visitors observed at the Apostle Islands.

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