

INDICATORS AND STANDARDS OF THE QUALITY OF THE VISITOR EXPERIENCE AT A HEAVILY-USED NATIONAL PARK

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Contemporary approaches to determining and managing carrying capacity of national parks and similar areas focus on indicators and standards of quality. The National Park Service is currently developing the Visitor Experience and Resource Protection process which adopts this approach to carrying capacity. This process is being applied at Arches National Park, Utah, through a two-phase research program aimed at identifying indicators and standards of the quality of the visitor experience.

Introduction

As the name suggests, national parks are resources of national and, increasingly, international significance. The national park system contains natural, historical, and cultural resources of great importance to the nation and, in many cases, to the international community. Given the significance of this resource base, public demand to see and experience these areas should not be surprising.

Data on national park visitation dramatically support this premise. Annual visitation to the national parks is now counted in the hundreds of millions. In the decade of the 1970s, visitation increased by 30 percent. In the 1980s, visitation rose another 35 percent. If this trend continues, the national parks can expect an additional 60-90 million recreation visits by the year 2000.

The increasing popularity of the national parks presents both an opportunity and challenge to the National Park Service (NPS). The opportunity is to fulfill the mission of the NPS "to provide for the enjoyment" of the national parks. The accompanying challenge, of course, is to conserve park resources for the enjoyment of future generations. This can prove difficult under conditions of high visitation.

Implicit in this dual mission of the NPS is the issue of the *quality of the visitor experience*. The quality of visitor experiences must be maintained at a high level for the national parks to contribute their full potential to the enjoyment of society. Moreover, high quality visitor experiences are more likely to develop public appreciation of, and support for, conservation of national park resources.

It is ironic that one of the greatest threats to the quality of national park visits is commonly seen as their increasing popularity. To many observers the national parks, at least in some places and at some times, are crowded, and this detracts from the quality of the visitor experience. In more formal terms, the use of some national parks, or portions thereof, have exceeded their *carrying capacity*.

This paper explores the theory and application of carrying capacity of the national parks. The first section briefly traces the theoretical development of the carrying capacity concept. The second section describes a process now being developed to help determine and manage carrying capacity in the national parks.

The final section outlines research now underway to apply this carrying capacity process. The importance of indicators and standards of quality is highlighted throughout this discussion.

The Concept Of Carrying Capacity

The question of how much public use is appropriate in a national park is often framed in terms of carrying capacity. Indeed, much has been written about carrying capacity of the national parks and related areas. The underlying concept of carrying capacity has a rich history in the natural resource professions. In particular, it has proven a useful concept in wildlife and range management where it refers to the number of animals of any one species that can be maintained in a given habitat (Dassmann 1964). Carrying capacity has obvious parallels and intuitive appeal in the field of park management. In fact, it was first suggested in the mid 1930s as a park management concept in the context of the national parks (Summer 1936). However, the first rigorous applications of carrying capacity to park management did not occur until the 1960s.

These initial scientific applications of carrying capacity to park management suggested the concept was more complex in this new management context. At first, as might be expected, the focus was placed on the relationship between visitor use and environmental conditions. The working hypothesis was that, in absence of compensatory management, as visitor use intensity increases, it causes greater environmental impact as measured by soil compaction, destruction of vegetation, and related variables. It soon became apparent, however, that there was another critical dimension of carrying capacity dealing with social aspects of the visitor experience. Wagar (1964), for example, in his early and important monograph on the application of carrying capacity to recreation reported that his study

"...was initiated with the view that the carrying capacity of recreation lands could be determined primarily in terms of ecology and deterioration of areas. However, it soon became obvious that the resource-oriented of view must be augmented by consideration of human values."

Wagar's point was that as more people visit a park, not only can the environmental resources of the area be affected, but also the quality of the visitor experience. Again, the working hypothesis was that, in the absence of compensatory management, as visitor use intensity increases, it causes greater social impacts as measured by crowding and related variables. Thus, as applied to national parks and related areas, carrying capacity has two components: environmental *and* social.

The early work on carrying capacity has since blossomed into an extended literature based on environmental and social aspects of outdoor recreation and their application to carrying capacity (Stankey and Lime 1973; Manning 1985; Kuss et al. 1990; Shelby and Heberlein 1986; Lime and Stankey 1971; Manning 1986; Graefe et al. 1984; Cole 1987; Hammitt and Cole 1987). But despite this impressive literature base, efforts to determine and apply carrying capacity to areas such as the national parks have often resulted in frustration. The principal difficulty lay in determining how much impact was too much. Theoretical development, backed up by empirical research, generally confirms that increasing visitor use leads to increasing environmental and social impacts. But how much impact should be allowed in a national park? The basic question is often referred to as "the limits of acceptable change" (Lime 1970; Frissell and Stankey 1972). Given substantial demand for public use of a national park, some decline or change in resource quality and/or in the quality of the visitor experience appears inevitable. But how much decline or change is acceptable or appropriate?

The relationship between intensity of visitor use and environmental/social impacts is illustrated hypothetically in Figure 1. It is clear that visitation causes impacts and that in the absence of compensatory management, these impacts increase with increasing visitation. What is not clear is the point at which carrying capacity has been reached. Again, the difficulty in

carrying capacity determination lies in deciding how much impact is appropriate or acceptable.

To emphasize and further clarify this issue, some writers have suggested distinguishing between descriptive and evaluative components of carrying capacity determination (Shelby and Heberlein 1986). The descriptive component of carrying capacity focuses on factual, objective data such as the types of relationships in Figure 1 (see next page). For example, what is the relationship between the number of visitors entering an area and the number of encounters that occur between groups of visitors? Or what is the relationship between the intensity of visitor use and visitor perceptions of crowding? The evaluative component of carrying capacity determination concerns the seemingly more subjective issue of how much impact or change in the recreation experience is acceptable. For example, how many contacts between visitor groups are appropriate? What level of perceived crowding should be allowed before management intervention is necessary?

Recent experience with carrying capacity suggests that answers to the above questions can be found through formulation of management objectives and development of indicators and standards of quality (National Park Service 1992; Shelby et al. 1992). This approach to carrying capacity focuses principal emphasis on defining the type of visitor experiences to be provided and maintained, and then monitoring conditions over time to assess whether or not acceptable conditions have been exceeded.

Management objectives are broad, narrative statements which define the type of visitor experience to be provided. They are based on a review of the purpose and significance of the area under consideration. Formulation of management objectives may involve review of legal, policy and planning documents, consideration by an interdisciplinary planning/management team, and public involvement.

Indicators of quality are more specific measurable variables which reflect the essence or meaning of management objectives. Indicators of quality may include elements of both the physical and social environment that are important in determining the quality of the visitor experience. Standards of quality define the quantitative and measurable condition of each indicator valuable.

By defining indicators and standards of quality, carrying capacity can be determined and managed through a monitoring program. Indicator variables can be monitored over time and once standards have been reached, carrying capacity has been reached as well. This approach to carrying capacity is central to contemporary park planning frameworks, including Limits of Acceptable Change (LAC) (Stankey et al. 1985), Visitor Impact Management (VIM) (Graefe et al. 1990), Carrying Capacity Assessment Process (CCAP) (Shelby and Heberlein 1986), and the Visitor Experience and Resource Protection (VERP) process currently under development by the NPS (National Park Service 1993).

Carrying Capacity in the National Parks: The Visitor Experience and Resource Protection (VERP) Process

The NPS has long recognized the need to apply the carrying capacity concept in parks that have been experiencing problems from increasing public use. The 1978 General Antiquities Act requires each park's general management plan to include "identification of and implementation commitments for visitor carrying capacities for all areas of the unit." Although NPS management policies and planning guidelines acknowledge this responsibility, there has been little direction or agreement on a methodology for how to identify a park's carrying capacity. Indeed, there has been no agency-wide agreement on the meaning of the term carrying capacity. Park managers are often uncomfortable saying that their parks, or areas within their parks, are receiving inappropriate or excessive use, because they lack the conclusive data and the rationale they need to make these controversial decisions.

For the past several years, NPS planners and consultants have been developing a process intended to help park planners and managers make sound decisions about visitor use. However, it is important to note that the VERP process is still being refined and has not yet been formally adopted by the NPS. The VERP process is based on many of the same elements and techniques included in the LAC and VIM methodologies. A major premise of the VERP process is that the NPS should manage visitor use continuously, the same way it manages resources. Visitor use management begins with a plan, but this is only a starting point; it continues as an iterative process of monitoring, evaluation, and adjustment. Moreover, the VERP process places principal emphasis on identification of indicators and standards of quality.

As shown in Figure 2 (see page 27), the VERP process consists of nine steps. The first six steps are requirements of general park planning, and ideally should be a part of each park's general management plan. The later steps in the process require annual review and adjustment, and are more appropriately handled through park operations and management activities.

Carrying Capacity of Arches National Park

The VERP process described above currently is being pilot-tested at Arches National Park, Utah. The purpose of this test application is to refine the VERP process and provide a model for application to the national park system. Below we describe research in progress aimed at defining indicators and standards of the quality of the visitor experience.

Arches National Park is comprised of 73,000 acres of high-elevation desert with outstanding slick rock formations, including nearly 2,000 stone arches. Most of the park's scenic attractions are readily accessible through a well-developed road and trail system. Visitation to arches has been increasing rapidly. The number of visits increased 91 percent in the decade of the 1980s, and the park received over three quarters of a million visits in 1993.

The carrying capacity research program at Arches was approached in two phases. Phase I was conducted in the summer of 1992 and aimed at identifying potential indicators of quality of the visitor experience (Manning et al. 1993). Personal interviews were conducted with 112 visitors throughout the park. In addition, ten focus group sessions were held with park visitors, park staff, and local community residents. Respondents and participants were selected through a purposive rather than random sampling procedure. Thus, data are primarily qualitative in nature. This exploratory effort was to begin learning about a variety of human-use aspects of visitation to Arches and to develop insights into potential indicators of the quality of the visitor experience. Interviews and focus group sessions were guided by a standardized questionnaire.

The questionnaire contained two major sections that focused on identifying potential indicators of the quality of the visitor experience. The first section contained a battery of open-ended questions which probed for park conditions and issues which visitors and others considered important to determining the quality of the park experience.

The second section of the questionnaire contained a battery of close-ended questions which also probed for indicators of quality. Fifty-three wide-ranging park conditions or issues were presented to respondents who were asked to indicate whether each item was considered to be a "big problem," a "small problem," or "not a problem;" a "no opinion" option was also presented. The items presented were developed on the basis of literature review, discussion with park planners and staff, and personal observations in the park.

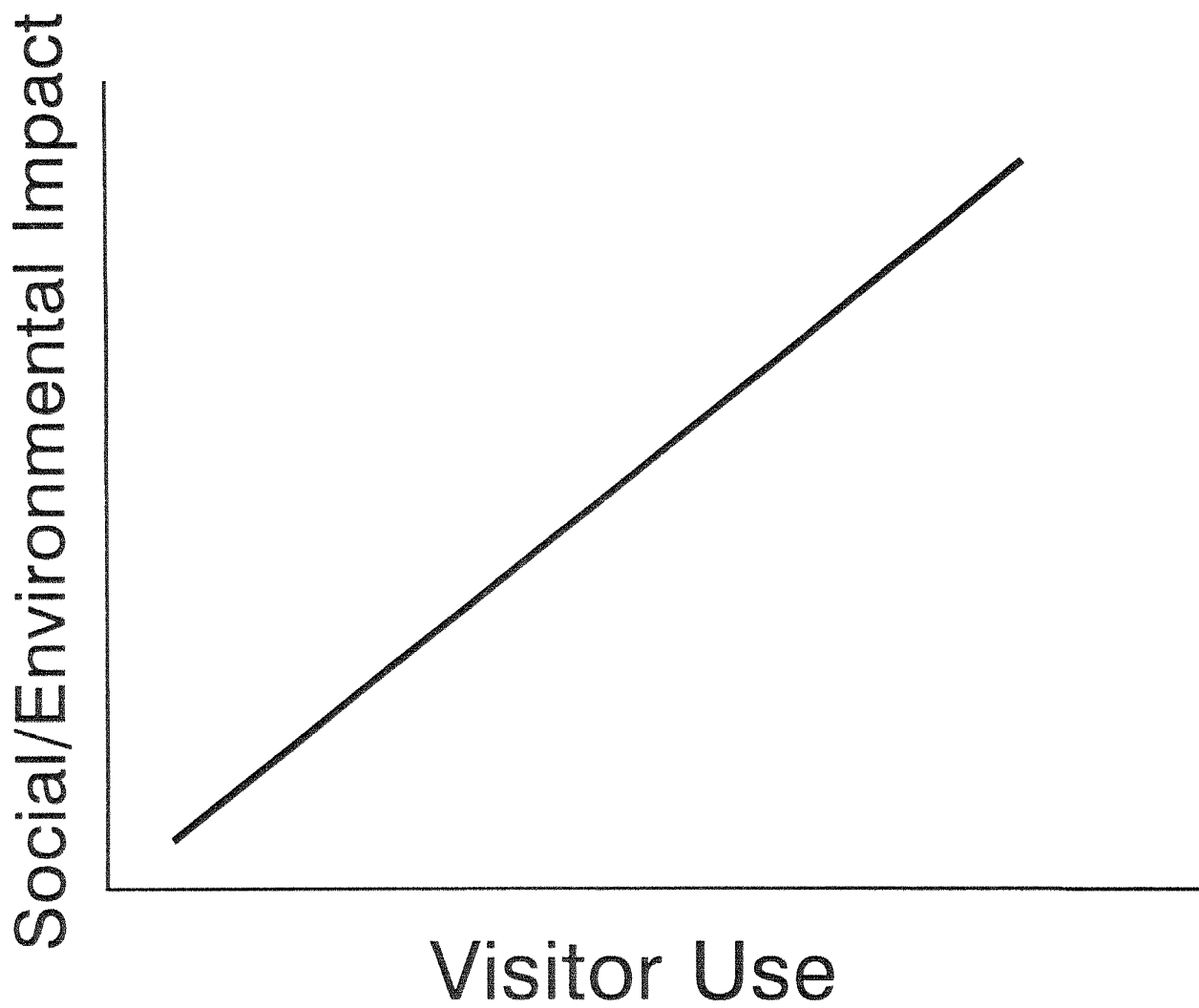


Figure 1. Hypothetical relationship between intensity of visitor use and environmental/social impacts.

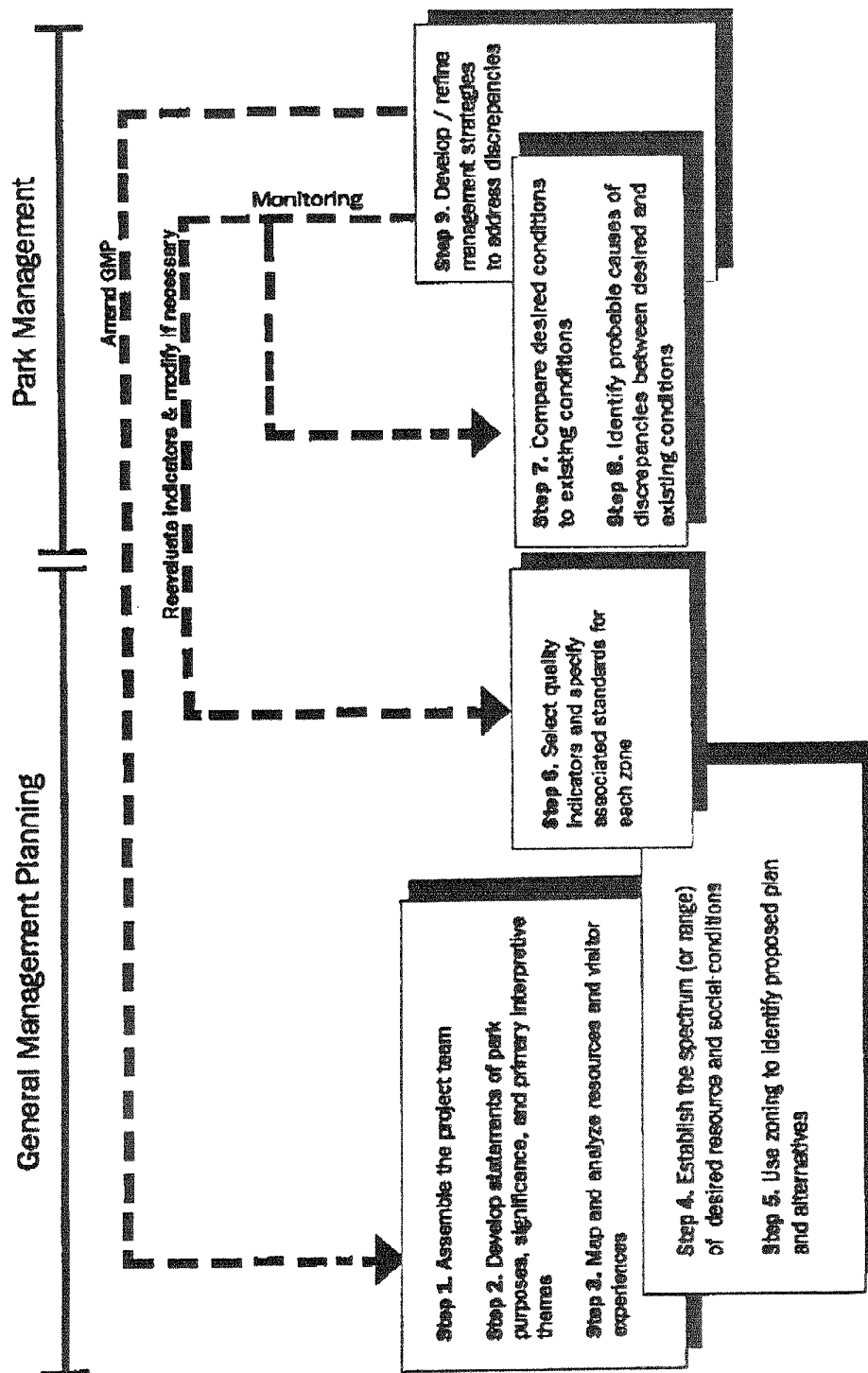


Figure 2. Visitor Experience and Resource Protection (VERP) process.

Responses to the battery of open-ended questions were coded into 91 categories. These categories were then grouped into eight similar subject matter classes or issues: 1) information/education, 2) facilities, 3) crowding, 4) visitor behavior and activities, 5) resource impacts, 6) park management actions, 7) natural features of the park, and 8) miscellaneous. It is apparent that visitors contacted perceive a variety of issues which have some importance in determining the quality of their park experience. Beyond this diversity, however, there is some consensus as well.

Good information, education, and interpretive facilities and services were often cited as contributing to the quality of the visitor experience, but relatively large numbers of visitors expressed a desire for more such programs. Many visitors feel it is important to know about the availability and location of visitor opportunities within the park and to learn more about the significance of park resources. An especially important theme of information and education efforts concerns the importance and knowledge of how to reduce visitor-caused impacts to park resources. For example, the opportunity to interact directly with a ranger through an interpretive program or informal conversation in the park is important to many visitors, and they frequently expressed the need for this activity to be expanded in the park.

Facility-related issues were also cited by many respondents. Many respondents found the hiking trails to their liking and appreciated the extent to which many of the park's major attractions were readily accessible. Visitor attitudes about other activity-related issues were more divided. The primary facility need appears to be more vehicle-accessible campsites. A host of other facilities were suggested by visitors, but each facility was mentioned by only a small minority of visitors. This was offset by a number of visitors who liked the general lack of facilities (or at least, commercial facilities) or felt no additional facilities should be developed in the park.

Many visitors contacted were concerned with crowding-related issues in the park. Twenty percent of respondents felt generally that there were "too many people in the park." Smaller numbers perceived some degree of crowding in selected locations such as parking lots, certain attraction sites, and trails.

Respondents expressed concern about a large variety of inappropriate visitor activities and behaviors. The most important of these behaviors was objection to visitors walking off trails.

Considerable visitor concern was focused on a variety of issues related to the resource impacts of public use. Relatively large numbers of respondents noticed and objected to resource impacts caused by off-trail hiking, graffiti, and litter.

Relatively few visitors included in the sample mentioned issues related to park management activity. The most frequently mentioned issue was that visitors found the park to be well maintained with a lack of visually obtrusive development, and that this contributed to the quality of their experience. For example, an especially positive condition was the general lack of signs and guard rails along park roads which, when present, detract from the visual quality of the setting.

Finally, the most frequently offered comment -- far and away -- was enjoyment and appreciation of the park's natural features, including the arches and the general scenery. While this is not surprising, it suggests that some indicator variable(s) be developed and monitored to ensure this opportunity is not diminished through damage to outstanding natural features or through facility development which detracts from their prominence or appreciation, or through diminished atmospheric visibility.

Responses to close-ended questions also illustrated that there were some widely shared concerns. A majority of respondents rated 14 of the 53 issues as a small or big problem. These 14 issues clustered into five categories:

1. Respondents reported considerable concern over visitors walking off trails and otherwise engaging in behaviors which caused *damage to park resources*.
2. Respondents expressed concern about selected aspects of *crowding* in the park.
3. Respondents expressed some concern over a perceived *lack of rangers* in the park.
4. Respondents expressed concern over two *facility-related issues*: lack of campsites and lack of drinking water.
5. Respondents expressed concern over a perceived *lack of public education programs* in the park.

Findings from the exploratory research in 1992 provided important insights into park conditions and issues which add to or detract from the quality of the visitor experience at Arches National Park. Potential indicators of quality range widely, spanning a variety of broad categories, including:

1. Orientation, information, and interpretive services
2. Visitor facilities
3. Visitor crowding
4. Visitor behavior and activities
5. Resource impacts of visitor use
6. Park management activities
7. Quality and condition of natural features

Phase II of the research program was conducted in 1993. The primary objectives of this phase of the research were to determine the relative importance of indicator variables and to set standards of quality for each indicator variable. A survey of park visitors was conducted in the summer and fall of 1993 at several locations throughout the park. The survey was administered to a representative sample of park visitors and was conducted by means of personal interviews and mail-back questionnaires.

The survey instruments contained two major sections related to carrying capacity. The first section focused on determining the relative importance of indicator variables identified in Phase I research. Fourteen indicator variables were distilled from the previous phase of research and respondents were asked to rate the importance of each variable in determining the quality of their experience at the particular location in the park where they were interviewed. This section of the questionnaire was needed for two reasons. First, Phase I research was qualitative in nature; its purpose was simply to explore for potential indicator variables. Phase II research was needed to become more quantitative by asking respondents to rate the relative importance of these potential indicators of quality. This required a larger and more representative sample. Second, it was hypothesized that indicator variables might vary by location within the park. Sampling was conducted at several areas within the park and questions were keyed directly at those specific areas. This would allow for a zoning approach to carrying capacity determination and management which was felt to be appropriate to a relatively large area such as a national park.

The second major section of the survey questionnaires was directed at determining standards of quality for selected indicator variables. Three indicator variables received special attention: 1) the number of people at one time at major attraction sites within the park, 2) the number of people at one time along major trails, and 3) the amount of environmental impact caused to soil and vegetation by off-trail hiking. All three of these variables were addressed by a series of photographs which illustrated a range of impact conditions. Photographs were developed using a computer-based image capture technology (Pitt 1990; Lime 1990; Nassauer 1990; Chenoweth 1990). Base photographs of park sites were taken, and these images were then modified to present a range of impact conditions. A set of sixteen photographs was developed for each attraction site and trail presenting a wide-ranging number of visitors present. An analogous set of five photographs was developed for a range of environmental impacts caused by off-trail hiking. Respondents rated the acceptability of each photograph. Representative photographs are shown in Figure 3.

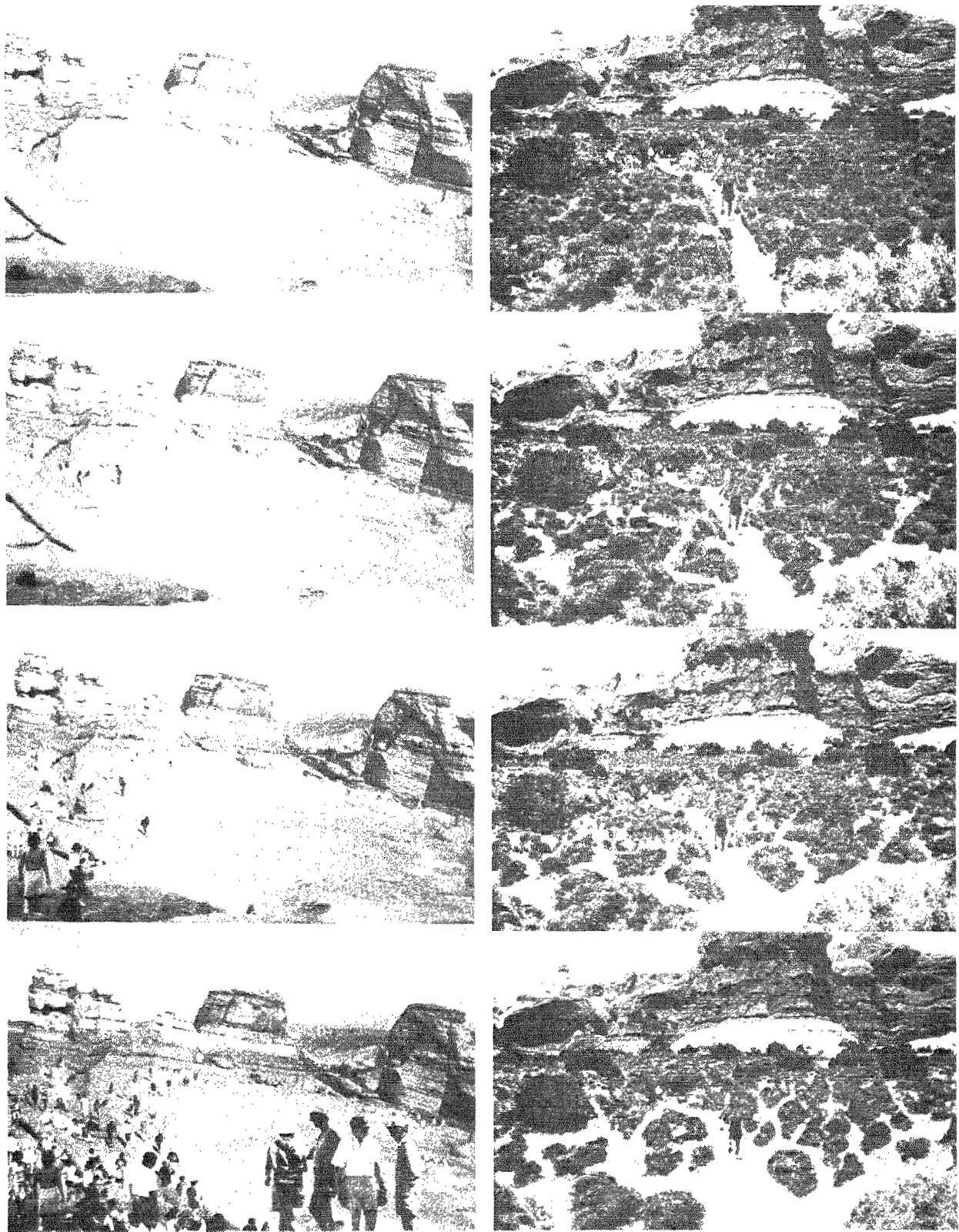


Figure 3. Representative photographs showing a) increasing levels of visitor use, and b) increasing levels of environmental impact.

Data from the second phase of the research program are now being analyzed. Standards-related data appear particularly promising. Figures 4 and 5 are illustrative. These graphs show the acceptability ratings of two of the sets of photographs described above. Figure 4 shows data for the number of people at one time at North Window, a major attraction site in the park. It is clear from the data that acceptability falls into the negative range between the photographs depicting 16 and 24 people. A regressed line plotted to these data crosses the "zero point" or "neutral line" at 20 people at one time. These findings provide a strong rationale for setting a standard of 20 people at one time at North Window.

Figure 5 shows data for the amount of environmental impact along trails at North Window. It is clear from the data that visitors are especially sensitive to this indicator variable. Only the first photograph in the series depicting the trail with no ancillary environmental impact or "social trailing" is judged acceptable. All other levels of environmental impact are judged unacceptable. These findings provide a strong rationale for setting a standard of no social trailing at North Window.

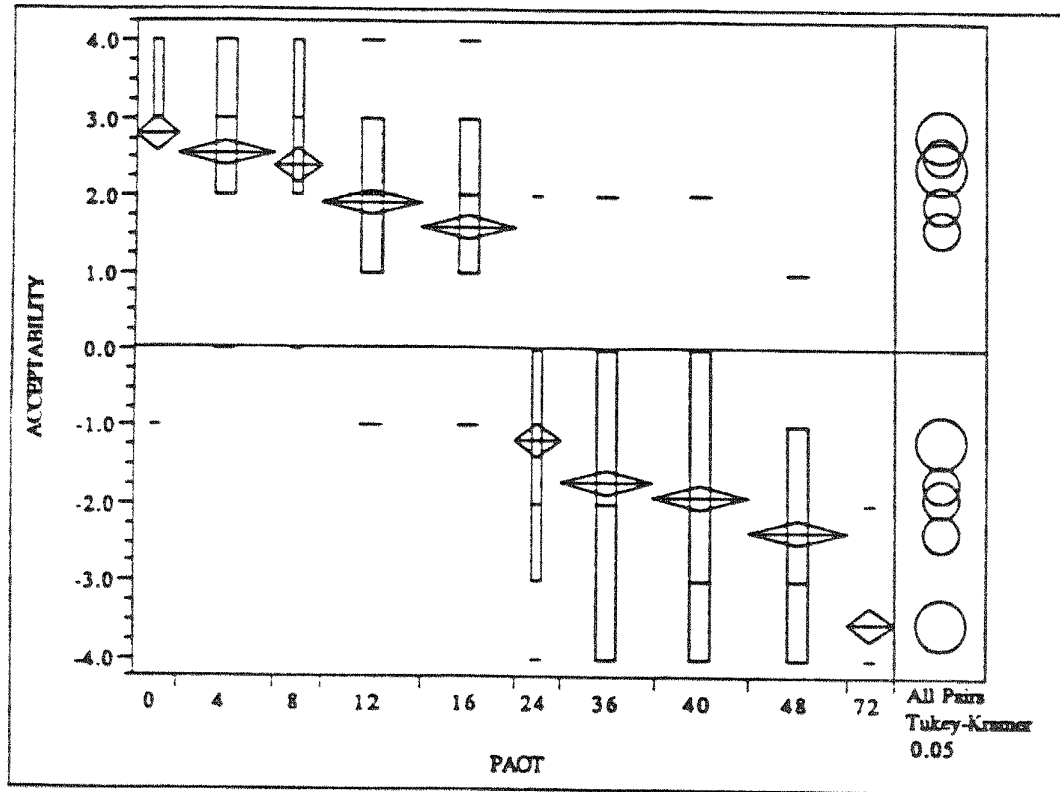


Figure 4. Normative standards for acceptability of the number of people at one time at North Window.

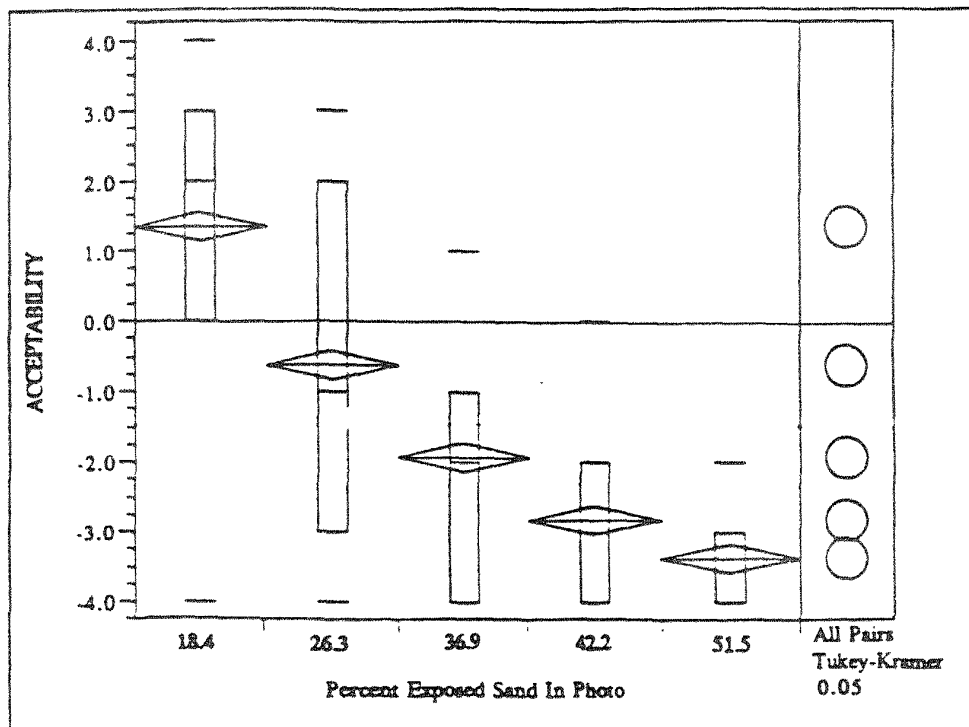


Figure 5. Normative standards for acceptability of environmental impact along trails at North Window.

Conclusion

The VERP program currently being developed by the NPS is designed to provide a theoretically sound basis for establishing and managing the carrying capacity of national parks and similar areas. The program focuses on identification of indicators and standards of the quality of the visitor experience. A monitoring program can then be established to determine whether or not standards, and thus carrying capacity, are being violated.

This program is now being applied at Arches National Park. A program of research has been conducted to identify indicators of the quality of the visitor experience and help set standards for these indicator variables. A variety of management actions will ultimately be initiated to manage the park within its defined carrying capacity. These actions might include the design capacity of attraction site parking lots and a trail/backcountry permit system. A monitoring program will be designed focused on indicator variables and will trigger management action if standards of quality are violated.

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