Visitor and Recreation Impact Monitoring: Is It Lost in the Gulf between Science and Management?

David N. Cole

PARK MANAGERS HAVE SELDOM HAD THE SCIENTIFIC INFORMATION ON RECREATION and its impacts that they need. Despite allocating substantial portions of park budgets to visitor management, few resources are typically allocated to recreation science. This is hugely problematic. Visitors are a focal species in every park and yet we have little systematic information about how many there are, where they go, what they do, and how they impact the biophysical resource. In this essay I explore potential reasons why neither managers nor scientists have effectively advocated for a strong recreation science program in the parks and argue that visitor-related variables need to be a larger part of every park's routine data collection program.

Recreation monitoring is important

Lack of data has forced managers to rely largely on their own personal experience and judgment to draw conclusions about trends and even about whether or not recreation-related problems exist. They have had to draw on that experience and on common sense to decide which management actions are needed to correct problems, as well as to assess whether or not the actions they implemented were successful. This era of deference to professional expertise is waning, however. Increasingly, this approach has been deemed inadequate and the authority of technocrats is being challenged. There is increased acknowledgment that frequent turnover of personnel makes it difficult to rely on personal observations to assess trends, even disregarding concerns about the biases of such observations. Varied stakeholders have different views about what should or should not be considered a problem, making it increasingly important to defend any actions that are taken. There is increasing uncertainty about which management actions are most effective, and, given the costs of implementing actions (financial and otherwise), more importance has been attached to accurately assessing effectiveness. Finally, there is increased use of litigation when stakeholders perceive that their interests have been slighted.

All of this calls for a different type of professionalism than was prevalent in the mid-twentieth century. It calls for park management that relies less on personal observation and instinct, is more responsive to the views of stakeholders, is guided more by explicit management objectives, and is more science-informed. The demand for this new type of professionalism in recreation management has not been as shrill nor has it come as soon as it did for management of some other resources and values (e.g., wildlife). But its time has come. We can see

it in demands for more public involvement in decisions about recreation management, about whether use should be limited or not. We see it when parks are successfully sued for not meeting legislative mandates to address user capacity in their management plans.

Professional management in the twenty-first century must be science-informed, and this requires a commitment to monitoring. This is as true of professional programs to protect park resources from visitor impacts as it is of professional programs to protect populations of grizzly bears. We need inventory and/or monitoring data on the location, nature, and magnitude of impacts to assess the current condition and—if standards exist—to decide whether or not current conditions are acceptable. We need monitoring data to identify trends in the distribution and magnitude of impacts and to assess the effectiveness of management actions taken to protect park resources. In the absence of such data, park management will continue to be only as good as the personal biases, opinions, observations, and judgments of whoever happens to be in charge.

Visitor and impact monitoring has been ignored

Agencies that manage recreational lands, such as the National Park Service, typically spend the majority of their resources on visitor management. They build and maintain transportation systems (roads, trails, etc.), as well as sites for overnight accommodation (hotels, campsites, etc.). They hire rangers to patrol. They develop interpretation and educational programs. To protect resources and provide high-quality visitor experiences, they implement management programs that can involve such diverse actions as limiting use, regulating behavior, and restricting where certain activities can occur. When sites are excessively damaged, they are often closed and restored.

Remarkably, all these resources are expended on management without the benefit of much data on visitors and their impacts. In the National Park Service, for example, there is reasonably good data on overall park visitation and on overnight visitors. However, most park use is day use and there is little information on day users—other than that they entered the park. Data on the impacts caused by park visitors are even sparser. In a recent survey of all the wilderness areas in the United States, Cole and Wright (2003) found that only 24% had any baseline data on their visitors. Fifty-one percent had some data on campsites and 9% had data on trail impacts. Even for campsites, most areas had rather crude data for a non-representative sample of sites for only one period in time.

Why is there so little interest in monitoring recreation in parks when it receives so much management attention? Why is it common to spend more money on monitoring elk or grizzly bears than on visitors and their impacts? Is this a problem?

It is a problem, I believe, because lack of investment in monitoring in the past makes it extremely expensive to use the commonly accepted best practices for managing recreation, frameworks such as Limits of Acceptable Change (LAC) and Visitor Experience and Resource Protection (VERP) that are based on the establishment of standards and that require monitoring data (Stankey et al. 1985; National Park Service 1997). Park administrators blame this "new" expense on these processes, when the real problem is that monitoring is

something that should have become a routine part of park operations a long time ago. Of course it's expensive to develop a more professional, science-informed management program when data have never been routinely collected. Imagine how expensive an elk management plan would be if nobody had ever attempted to estimate how many elk were in the park, the impacts they cause, or the factors that influence the distribution and magnitude of elk populations. Visitors are a focal species in every park. We need to know how many there are, where they go, what they do, and how they affect the biophysical resource—just as we do for elk. Visitor-related variables need to be a larger part of every park's routine data collection program.

Lost in the gulf between science and management

My fundamental thesis is that the lack of attention to monitoring of visitors and their impacts results from what I consider to be false beliefs on the part of both managers and scientists. It has been my experience from observation as part of numerous meetings and conversations that managers typically consider recreation to be important but do not consider recreation science necessary (or at least they are ineffective in advocating for recreation science). Most scientists do not even consider recreation science to be very important, seldom assigning it a very high priority in any hierarchy of research needs. Consequently, neither group takes responsibility for visitor and impact monitoring, so monitoring gets lost in a gulf between science and management.

Managers' beliefs

The fact that management expends few resources on monitoring visitation and visitor impact-related variables, despite visitation and impacts being such a major focus of management programs, suggests there is a widespread belief that management based on common sense and personal experience is good enough. Perhaps the prevalence of this belief should not be surprising. Management budgets are severely constrained and it is uncommon for either the public or the administration to hold recreation managers accountable for inadequate management objectives, inadequate data, or an inability to justify the management actions they have taken. As long as agencies are allowed to manage like this, it is likely to be the preferred approach. It is inexpensive (in the short-term), personally rewarding (because managers can mold the park to their vision of the way it should be), and monitoring can be viewed as an unnecessary expense that, in times of constrained budgets, keeps the park from doing "what needs to be done."

But the lack of science-informed management is problematic. It forces managers to be more reactive than proactive—to respond to problems rather than avoid them. Too often they must rely on best guesses, or anecdotal and impressionistic information, rather than on systematically collected monitoring data. They then select management actions, not on the basis of clear management objectives, but on the basis of their personal inclinations or what they are most familiar with. Of course, not all parks are managed like this and many managers would do more monitoring of visitors and their impacts if more resources were available. However, the belief that recreation can be managed professionally without such data is prevalent enough that there is little impetus for expanding monitoring programs.

Are recreation impacts not significant?

One potential explanation for why most park scientists have little interest in monitoring recreation impacts (e.g., why it is typically not a significant part of the National Park Service's Inventory and Monitoring Program) is a belief that recreation is not a significant threat to the integrity of park ecosystems, to the degree that the effects of fire suppression, invasive species, climate change, and other threats are. I have been in numerous meetings where this assertion has been made. While this conclusion may ultimately be warranted, I have never heard a rigorous defense of this belief. Recreation impacts on stationary resources (vegetation and soil, as opposed to animal populations) can be characterized as being high in intensity and low in extent. A heavily used campsite, for example, is typically almost as intensely disturbed as it could possibly be. It retains few vestiges of its original composition, structure, or function. Most native species are gone; vegetation and soil layers are missing; chemical cycles have been altered, as have soil–plant–animal relationships. However, the total area of the park that is in this state is typically small. Although the size of the recreation impact "footprint" is undoubtedly higher in frontcountry and higher still in more developed park settings, studies in backcountry and wilderness suggest that recreation impacts on vegetation and soil (mostly on trails and campsites) typically are confined to 1% of the area or less (e.g., Cole 1981).

This can be contrasted with the impacts of air pollution (or fire suppression), which, in comparison with recreation impacts, are of low intensity and high extent. Air pollution does cause changes in composition, structure, and function, but typically most native species remain, as do most layers of vegetation and soil, and changes in function are subtle. However, entire parks can experience these subtle changes, leaving no places free from this disturbance. Are such disturbances more significant than those caused by recreation? And do we consider all high-intensity, low-extent disturbances (e.g., mining) to be relatively insignificant ecologically?

There may ultimately be a substantial consensus that high-intensity, low-extent impacts are less significant than low-intensity, high-extent impacts. For example, most people might agree that the significance of impacts should only be evaluated at the scale of the landscape or region (rather than the site). They might also agree that low-extent disturbances, even when they are very intense at the site scale, as recreation impacts are, can be evaluated as low-intensity disturbances at larger spatial scales. But this is clearly a normative judgment, not an objective truth. Therefore, it is important to make the criteria for evaluating significance explicit. And if we decide that recreation impacts are not significant enough to invest in monitoring, what does this suggest about the wisdom of investing so heavily in managing those same impacts?

Are recreation impacts uninteresting?

Another possible explanation for lack of interest stems, ironically, from the fortuitous fact that stationary recreation impacts can be measured directly (rather than inferred) and that inexpensively measured indicators (e.g., bare ground) have been developed that make it unnecessary to routinely take expensive measurements of such response variables as nutrient cycling. Recreation is one of those rare threats where it is possible to measure impacts (at least the stationary ones) directly.

Conditions on campsites, for example, can be compared with conditions on neighboring undisturbed sites, with the difference providing a relatively accurate estimate of the impact of recreation on soil and vegetation. Scientists who have been given the task of quantifying the effects of air pollution or impacts on wildlife populations, in contrast, must take periodic measures of vegetation or of wildlife and then attempt to estimate impacts by deciding how much of any observed change results from natural causes and how much from human activities of concern. Such estimates are likely to be only as accurate as one's untestable assumptions about causation.

In addition, enough studies of recreation impact have been conducted to clarify many of the diverse and intense impacts that occur wherever regular recreation use occurs (e.g., Liddle 1997). Consequently, it has become common to simply monitor the extent of bare area (on trails and campsites, for example), as an indicator of the magnitude of all the compositional, structural and functional changes that have occurred wherever there is barren ground. Much as monitoring one's pulse is much more cost-effective than taking an electrocardiogram, monitoring bare area is much more cost-effective than measuring changes in biogeochemical processes. It is important to remember, however, that we are measuring bare area, not because we are interested in bare area *per se,* but because it is a good indicator of the varied ecological impacts (e.g., changes in biogeochemical processes) that we are interested in.

The problem, I think, is that scientists trained to study phenomena such as biogeochemical cycles find it much more interesting to study biogeochemical cycles than to measure indicators such as bare area. The same probably holds true for most other scientists, those who were trained as botanists and wildlife biologists and would rather study plants and animals than monitor indicators such as bare area. This may lead them to assert, as I have frequently heard, that one is not doing "science" or "ecological monitoring" if one is measuring something like bare area. Although it may be more interesting to measure the size of a fish scale or a bear claw than the size of a barren campsite, such measurements are no more "scientific."

Please do not misunderstand me. I am not arguing that we should not study plants, animals, and biogeochemical cycles. However, once we have established good indicators, and when our goal is to monitor impacts on park resources, we should utilize the efficiencies that come from using indicators. Monitoring bare area can be as scientifically valid and as ecologically important as monitoring biogeochemical cycles.

We need more recreation impact monitoring

Regardless of the reasons, monitoring of visitation-related variables, including recreation impacts, is clearly being ignored by parks that are expending substantial resources managing visitation and associated impacts. This is hugely problematic for several reasons. First, when more professional visitor management planning is required (e.g., when a park is sued for not addressing user capacity adequately), the costs of doing a good plan seem exorbitant. Consequently, legal mandates are often ignored until the courts intervene and force the agencies to comply with their mandates. Second, without monitoring data, management is reactive and too strongly influenced

by the biases of whoever happens to be in charge. And this leads to my third concern, that not having access to reliable data—being reactive rather than proactive—results in incremental decision-making, the tyranny of small decisions described by Kahn (1966). The tendency is to always search for the compromise that results in the least controversy, which usually means the least change from the *status quo*. This, in turn, leads to creeping degradation and mediocrity—the last thing we want for our parks and protected areas.

To avoid this, parks and protected areas need to invest more in monitoring of visitors and their impacts. Such monitoring should be commensurate with the investment that is made in management of visitors and their impacts. Human beings are one of the focal species of parks and, as such, should be given at least as much attention as other focal species in the park. My intent in this essay is to encourage both managers and scientists to examine their beliefs regarding park visitors and their impacts and to come together to make sure that necessary monitoring occurs. Managers must recognize that their visitor management programs need a stronger foundation in recreation science—that heavy reliance on intuition and personal judgment is no longer adequate. They must be willing to allocate more resources to recreation monitoring. Scientists need to reflect on how central visitor management is to park stewardship and work to build a scientific foundation for visitor management, much as they have for such programs as fire management and wildlife management.

References

Cole, D.N. 1981. Vegetation changes associated with recreation use and fire suppression in the Eagle Cap Wilderness, Oregon: Some management implications. *Biological Conservation* 20, 247–270.

Cole, D.N., and V. Wright. 2003. *Wilderness Visitors and Recreation Impacts: Baseline Data Available for Twentieth Century Conditions*. General Technical Report RMRS-GTR-117. Ogden, Utah: U.S. Department of Agriculture–Forest Service, Rocky Mountain Research Station.

Kahn, A.E. 1966. The tyranny of small decisions: Market failures, imperfections and the limits of economics. *Kyklos* 19, 23–47.

Liddle, M. 1997. *Recreation Ecology: The Ecological Impact of Outdoor Recreation and Ecotourism*. London: Chapman & Hall.

National Park Service. 1997. *VERP: The Visitor Experience and Resource Protection (VERP) Framework—A Handbook for Planners and Managers.* Denver: NPS Denver Service Center.

Stankey, G.H., D.N. Cole, R.C. Lucas, M.E. Petersen, and S.S. Frissell. 1985. *The Limits of Acceptable Change (LAC) System for Wilderness Planning*. General Technical Report INT-176. Ogden, Utah: U.S. Department of Agriculture–Forest Service, Intermountain Research Station.

David N. Cole, Aldo Leopold Wilderness Research Institute, P.O. Box 8089, Missoula Montana 59807; dcole@fs.fed.us