

Use Density, Visitor Experience, and Limiting Recreational Use in Wilderness: Progress to Date and Research Needs

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Abstract—Recent increases in demand have revitalized interest and controversy surrounding use limits and the effect of visitor density on wilderness experiences. A workshop held in Missoula, Montana, in June of 2000 addressed the potential for social science to contribute to understanding and managing increasingly populated wilderness conditions. Scientists identified progress in our understanding of use density impacts on the wilderness visitor. Management frameworks such as Limits of Acceptable Change have proven beneficial in assisting managers. Science has also advanced the ability to assess and interpret visitor opinion about use density. However, several limitations to our understanding and research needs emerged from this workshop. Contemporary visitor assessments have largely been constrained to current visitors of individual management units. Visitor opinion tends to focus on indicators rather than the actual experience of individuals. We need an improved understanding of the multidimensionality of the wilderness experience and how solitude is defined as one dimension of experience. Poor understanding of the impacts of use limits on visitor experiences and population dynamics is also a problem. The absence of information about visitors, at regional scales, poses problems to understanding how visitor populations are affected by use limits or why objections to limits are prevalent in some places and not others. To address these issues, the science community will need to be inclusive of additional research methods based on a broader suite of conceptual frameworks that can be integrated at multiple scales.

Introduction

Wilderness means different things to different people. Virtually everyone would agree, however, that to be wilderness (in the context of public lands) a place must be relatively uncrowded. To use the particular words contained in the Wilderness Act, wilderness should provide “outstanding opportunities for solitude.” Wilderness need not be completely deserted. There can be other people around—just not too many. If there are too many, those visitors who desire solitude, privacy, opportunities for contemplation, and so

on, may have difficulty achieving these. Certainly, attributes other than uncrowdedness are also essential to wilderness. Relative naturalness, lack of development and modifications, for example, are also necessary for a place to be wilderness. Nevertheless, the density of recreation use is without question among the primary attributes of the wilderness setting.

As the population of the United States has increased, total recreation use of wilderness has increased, as has the density of recreation use in most wilderness areas. As early as the 1930s, a few people were expressing concern about overuse of wildlands and asking how much use wildlands could sustain (Sumner 1936). Recreation use of wilderness increased exponentially during the 1950s and 1960s. By the 1960s, both the social and ecological impacts of recreation use were being studied and the concept of recreation carrying capacity had been advanced. By the early 1970s, some wilderness areas began limiting recreation use. The first use limits were highly targeted. In 1972, boating use was limited on the Middle Fork and Main Salmon Rivers in what is now the Frank Church—River of No Return Wilderness and overnight use was limited at one popular lake basin (Rae Lakes) in Kings Canyon National Park. By 1973, use limits were more widespread. Use was limited on more rivers, throughout the backcountry of Yosemite and Kings Canyon National Parks, in the San Geronio and San Jacinto Wildernesses and at Aravaipa Canyon (a BLM area designated as wilderness in 1984). Outside the Western United States, use limits were imposed at Linville Gorge Wilderness in 1974 and within a few years in the Great Gulf and Boundary Waters Canoe Area Wildernesses and at Isle Royale National Park. By 1980, recreation use was limited in 23 areas that currently are designated as wilderness.

About the time wilderness managers began adopting use limits, recreation researchers began advising against the widespread implementation of use limits. Use limits were to be used only as a last resort (Hendee 1974). Arguments advanced against use limitation included the nonlinear relationship between amount of use and amount of impact and the potential to control impact in other ways (Lime and Stankey 1971). In the late 1970s, use dispersal was widely promoted as a strategy that might alleviate the need to limit use (Stankey and others 1976). By the early 1980s, as some of the problems with use dispersal emerged (Cole 1981), low-impact education was advanced as the means to avoid use limitation (Bradley 1979). Hope that use limits might be the exception rather than the rule was furthered by reports that wilderness use was no longer increasing (Lucas 1989).

By the late 1990s, the pendulum had swung back and management interest in use limitation is on the upswing

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again. It is now clear that wilderness recreation use is increasing (Cole 1996) and probably always will unless it is controlled. Activities that favor wildland settings (such as hiking, backpacking, cross country skiing) are increasing in popularity at the national level (Cordell and others 1997). Moreover, people are migrating to places with abundant outdoor recreational opportunities and natural scenery (Cordell 2000). Increased populations in close proximity to wildland resources will likely result in increased use levels.

Recreation impacts have spread across many wilderness areas over the past several decades (Cole 1993), despite increased attention to low-impact education. Crowding has increased greatly at popular wilderness destinations. Concern about day-users and their impacts, typically unmanaged in the past, have also increased. Many managers are considering limits on day-use and a few limits on day-use are already in place.

Lime and Buchman (1974), in a paper extolling the virtues of mandatory permits, noted that we were on the verge of instituting a system-wide wilderness permit system. That same year, Al Wagar (1974) stated "For wilderness, use limits are inevitable." Two and a half decades later, permits are required and recreation use is limited in most National Park Service wilderness areas but in only a handful of the wilderness areas managed by other agencies. These other agencies have spent much of the past several decades trying to avoid these actions—hoping that increasing demand could be accommodated within an expanding wilderness system or on lands outside wilderness, and that impacts might be controlled by reducing *per capita* impacts. Increasingly, however, wilderness managers perceive the limits of these strategies and realize they may need to eventually limit use. Use density is increasing faster than *per capita* impacts are decreasing and, therefore without use limits, social and ecological impacts will increase endlessly.

Ironically, now that managers are seriously considering use limits again, public outcry against such limits has become more shrill and perhaps more widespread. Requirements for public involvement in management planning have increased, as have calls to base controversial management decisions on science. The implications of research are not always straightforward. For example, visitor studies in high-use wilderness destinations show that visitors encounter more people than they prefer but do not support the imposition of use limits at this time (Cole and others 1997). Should managers veto most visitors' opinions about appropriate management prescriptions in order to provide preferred experiences? Or should they honor most visitors' opinions about management, recognizing that the result will be experiences that differ from preferred experiences? How can science best inform management decisions related to use limits and wilderness experiences?

An Example: Wilderness on the Mt. Hood National Forest, Oregon

Controversy surrounding management of three wilderness areas on the Mt. Hood National Forest illustrates the importance of these issues. All three of these wilderness

areas are located within a one to one-and-a-half-hour drive from the Portland metropolitan area. The Salmon-Huckleberry Wilderness is lightly used, with the exception of heavy day use along the Salmon River. The Hatfield Wilderness also receives relatively light use, except for the Eagle Creek trail corridor that leads to several lakes that are popular overnight destinations. In contrast, much of the Mt. Hood Wilderness is heavily used. Day use is particularly heavy at Ramona Falls—several easy miles from the trailhead. Moreover, Mt. Hood is one of the most frequently climbed mountains in the world. On an average weekend, more than 200 people per day summit Mount Hood *via* the South Climb route. On some days, over 400 people attempt the summit.

The Mt. Hood National Forest Land and Resource Management Plan, completed in 1990, adopted regional wilderness standards for total encounters per day, campsite encounters, and campsite conditions. In 1994, the Forest began a "Limits of Acceptable Change" (LAC) planning process for these wildernesses. As monitoring data became available it was clear that conditions were often out of compliance with these standards. Compliance was most problematic for the encounter standards and in the Mt. Hood Wilderness. In 1998, the Forest issued the first LAC Wilderness Protection Environmental Assessment. That document proposed a management alternative that would have cut use by as much as 90 percent on peak-season weekends both at day-hiking destinations such as Ramona Falls, and on the South Climb of Mt. Hood. Public outcry was profound and seemed to catch the Forest Service off guard.

Responses to the Mt. Hood proposal—and similar ones at places such as Alpine Lakes Wilderness outside Seattle—clearly show that wilderness advocates harbor diverse opinions about solitude, desirable wilderness experiences, and the place of use limitation. Some take what might be considered a traditional "purist" approach to use limitation. They support limits wherever increasing use threatens outstanding opportunities for solitude. Many of these people believe that wilderness should be managed according to the "nondegradation" principle. This principle posits that wilderness conditions at the time of designation provide a minimally acceptable standard. Wilderness should be managed such that the quality of conditions (including opportunities for solitude) does not decline at all over time.

Other wilderness advocates, however, state that solitude is only one desirable quality of a wilderness experience and it is not always expected. They point out that the Wilderness Act mandates "outstanding opportunities for solitude *or* (emphasis added) a primitive and unconfined type of recreation." One could have a high quality wilderness experience—the trip of a lifetime—even without experiencing an outstanding degree of solitude. Many note that it is more important for them to have access to places like Ramona Falls and the South Side Climb than to have solitude on every trip. They note that—if they want solitude—they can find a place or a time where they can find it. Even in a popular area, on a popular weekend, solitude can be found simply by leaving the trail. Outstanding opportunities need not be provided on every acre of wilderness at all times. Many suggest that they would support use limits needed to maintain the ecological integrity of the wilderness but not in order to provide solitude everywhere at all times. Ira Spring,

a longtime wilderness advocate from the Seattle area, went so far as to work with Senator Slade Gorton to get language written into the Forest Service's Appropriations Bill advising against the use of "subjective" solitude standards in wilderness.

At Mt. Hood, Alpine Lakes, and elsewhere, the Forest Service is reconsidering their wilderness recreation policies in the light of this experience and the divergent opinions of wilderness advocates. The Mt. Hood National Forest has issued a second Environmental Assessment with a new preferred alternative. It strives for a compromise between divergent opinions. This alternative seeks to be responsive to the solitude mandate by emphasizing the preservation of solitude in the portions of wilderness that currently receive little use. In popular places, however, the focus of management efforts is on avoiding excessive resource damage and minimizing the need to curtail use of these places. Overnight use will need to be limited immediately, based on the number of existing acceptable campsites; but day use might be allowed to increase further. This is a 180 degree change from early use limitation programs with highly targeted limits applied to just the most highly used locations. It reflects recognition that such programs can displace use and problems, as well as the philosophy that all wilderness acres need not be managed to the same standard.

Is this appropriate? The wilderness management watchdog group, Wilderness Watch, doesn't think so. They have appealed the new plan. Even with this new direction, use will still need to be limited—but on what basis? Should we listen to visitors and attach more credence to ecological integrity as a limiting factor than to social conditions? These questions are not only applicable to popular places. Many lightly used wildernesses, still offering outstanding solitude and near-pristine conditions, are being discovered and used more frequently. How can we decide whether or not to limit use of low-density wilderness to keep it that way—as was done, for example, on the Selway River? More broadly, how can wilderness stewardship be implemented in a more systematic, less incremental way? And how can social science contribute to improved stewardship?

The Visitor Use Density and Wilderness Experience Workshop

To address the role of social science in informing decisions about appropriate visitor use densities and the implementation of use limits, a workshop was held in Missoula, Montana, in June of 2000. The workshop was founded on the assumptions that (1) relatively low use densities are a fundamental desirable attribute of wilderness, (2) use limits are needed at least in some portions of the wilderness system, and (3) science can contribute to better decisions about use limits. Given these assumptions, the workshop focused on the question of what science has and can contribute to decisions about where limits are needed, what those limits should be and on what they should be based? Answers to these questions depend, in turn, on understanding the nature of wilderness experiences and the influence of use density (and related variables such as encounters) on both

the nature and quality of experiences. Participants were invited to present the papers included in this proceedings, discuss progress to date on these issues and to suggest research needs. It was noted that this focus on use limits does not mean that use limits are the only or even among the more useful wilderness recreation management techniques.

Use Density and Use Limit Research: Contributions to Date

From Carrying Capacity to Tradeoffs

Several papers described early research on carrying capacity and use density, as well as experience with setting use limits. In an historical review, Cole describes how much of the work on carrying capacity stemmed from the early conceptual work of Wagar (1964). Following Wagar's lead, social research moved from descriptive studies to assessments of relationships between use levels, setting (social and biophysical) attributes and experiential quality. Conceptually, the attempt to borrow carrying capacity from range sciences was limited in success due to the difficulty of adjusting for human values using a purely technical calculation. In his paper, Manning describes recent progress in assessing appropriate use levels based on the normative approach. This can be viewed as a shift from technical calculation to making informed judgments. By using the term "informed judgment," Manning draws attention to the fact that in making decisions about appropriate use levels, managers must reconcile numerous and often contested human values.

The Limits of Acceptable Change (LAC) process (Stankey and others 1985) provided a technical framework within which to make use density decisions. Complimentary approaches to defining acceptable levels of use density have also been developed by the National Park Service, The National Park and Conversation Association and Parks Canada. Central to each of these processes are indicators and standards developed for setting attributes, including attributes such as visitor density that seem to influence visitor experiences. When conditions approach or are beyond standard, management actions are invoked to bring conditions into compliance with standards. Various forms of use limits are often among those designed actions.

Despite the existence of such technical frameworks, defining human acceptability and setting standards remains a challenge to managers. Frequently, managers turn to the research community for help with this challenge. In early research, scientists described the relationship between (1) visitor evaluations of the "acceptability" of the conditions they encountered, and (2) visitor reports of how many people they encountered. From this early focus on description, research approaches added an evaluative dimension. A social norm approach, described in Manning's paper, has been dominant. At the heart of the norm concept is the notion that visitors share, on some level, agreement on what managers "ought" to provide in a setting and to what extent they should impose sanctions (such as use limits) to ensure those conditions. Recently, research approaches are evolving in an attempt to assess how visitors make personal tradeoffs between acceptable numbers of

encounters and their ability to gain access to wilderness. Ultimately, while the tradition of evaluative assessment can assist managers in understanding how visitors may be affected by a use limit decision, any decision must still be based on the judgment of managers.

Research on Limiting Use

During the 1970s and 1980s, a parallel path of research and conceptual development explored the notion of perceived freedom and unconfined recreation. This work focused on the concept of obtrusiveness and the principle of keeping management presence as indirect as possible. The influence of education appeals, interpretive programs, and environmental attitudes was the focus of many of these studies. This focus on unobtrusive measures helps explain the reduced popularity of the use limit policies that had been commonplace in the 1970s.

Papers by Hall and by McCool (this proceedings) point out some further concerns about the implementation and efficacy of use limits. First, the concept of solitude has become more highly contested. Second, the wisdom of distributing use is being challenged. These two concerns are especially intertwined in the management of high use places in wilderness such as those on the Mt. Hood Forest. Should solitude be a mandated setting condition on all areas of each Wilderness? What can research on solitude offer to the discussion?

Contemporary wilderness managers face a number of solitude specific questions. Should some forms of solitude be sacrificed in high use areas of wilderness to safeguard the integrity of the remaining areas? Should there be a solitude opportunity spectrum? In their paper, Hollenhorst and Jones argue that existing research on solitude is not definitive enough to offer much guidance on these questions. They assert that the typical social-spatial (encounters within time or place) operationalization of solitude is an overly simplistic view of the concept. To support this contention, they look to the conflicting explanations of solitude within the existing wilderness literature. There they find interpretations of solitude related to norms, attitudes, desired privacy and involvement with the place or experience. They recommend that researchers “turn their gaze away from crowding and encounter norms towards the visitor’s capacity to realize solitude.” By tracing the humanist roots of solitude, they identify a moral rather than transcendental underpinning to the concept. They contend that solitude is a complex construct that is deeply internal to the Wilderness visitor. If so, perhaps we have underestimated the visitor’s ability to attain outstanding opportunities for solitude even within areas of high use density.

Moreover, providing opportunities for solitude is not the only experiential goal of wilderness managers. In this proceedings, Watson discusses research related to visitor conflict. Substantial visitor conflict reduces the quality of wilderness experiences at least as dramatically as loss of solitude. Moreover, conflict may often be related to visitor densities, suggesting the desirability of manipulating visitor densities to keep conflict to acceptable levels.

In summary, while social science has progressed in developing understanding of the wilderness visitor, the research foci have largely been constrained by mandates in the Wilderness Act that call for “solitude” and “unconfined

recreation.” Solitude has generally been operationalized as encounter levels and considered within the framework of an LAC type process. Studies of unconfined recreation have utilized the concepts of obtrusiveness and illustrated the importance of education and persuasion. Research approaches have evolved and gained sophistication, moving from descriptive studies to studies that are theoretically grounded and predictive. Use limits themselves, however, have had relatively little direct study.

Research Needs

Adoption of the Limits of Acceptable Change framework marked a movement from managing numbers of people to managing setting quality. The diffusion of LAC and subsequent frameworks has strongly influenced research related to visitor density and use limitation. At the workshop, we identified three problems with the way research has approached the issues of visitor density and use limitation within the LAC framework. First, research has focused primarily on questions related to defining indicators and standards rather than to questions of implementing management actions. Second, the unit of analysis is usually a single park or wilderness and confined to the current visitors of that area. Third, research has tended to focus on indicators or surrogates for the experience rather than the wilderness experience itself. These limitations point to some critical research needs.

Research on the Consequences of Use Limits

In addition to research on defining desirable or acceptable conditions, indicators and standards, research on the consequences of use limits is needed. In his paper, McCool points out several concerns reflecting inadequate research. First, the distributional consequences of use limits are unknown. Limiting use in one area may shift the burden to other areas that do not have the capacity to manage it. Are use limit policies a sledge hammer approach to solving impact problems? Do they treat symptoms or fundamental problems? The research community should evaluate the before and after effects of policy changes. For example, the current changes at the Mt. Hood or Three Sisters Wilderness provides a opportunity for testing hypotheses about the distributional affects of use limits or the lack thereof.

As Hall points out in her paper, use limits favor certain experiences. We do not know who is affected by use limits, to what extent or for how long. Many of the use limits established in the 1970s were based more on efficiency than equity. While efficiency is an important component of management, equity is a more important criterion for much of the public. The need to understand equity effects points out a need to determine how best to segment the population of wilderness visitors. Visitor segmentation raises many questions for the research community. Can people be segmented? Do we allow visitors to self identify? Do we marginalize people by segmenting them? Should we use the notion of purism or resource dependency to determine segmentation? Are there legitimate users of wilderness who are not purists? To what extent is the desire for

solitude a worthy means of segmenting visitors? If so, is solitude defined differently by different groups of people? We must also provide processes for everyone to make their voice heard. Is there a difference between who is listened to and who is managed for?

Research at Larger Scales

As just noted, imposing use limits implicitly favors some visitors over others. Depending on the situation, favoring may be geographic (locals versus tourists), financial (those who can afford access via outfitted groups), philosophical (those in closest line with the intention of the Wilderness Act), or political (those with the greatest influence on the planning process). As Cole points out in his paper, favoritism can be reduced if planners and managers can provide a diversity of opportunities. In such a system, different tastes are catered to in different places. This demands research and planning at scales larger than the norm.

Current area-by-area approaches provide insights into the preferences of current visitors. However, if every place is managed for the preferences of the average current visitor we will tend to provide relatively homogeneous recreational opportunities. We need to conduct research that will help managers of individual parks or wildernesses make decisions about standards and appropriate experiences that will maximize the benefits provided by a regional system of parks and wildernesses.

This type of research and planning will be challenging. Institutional incentives are typically directed toward the single unit that is a manager's unit of responsibility. We do not know the appropriate size for analysis or the properties of the larger spatial systems that should be studied. We are unaware of how visitors define spatial systems. Attention should be given to how research on constraints, incentives, place attachment, and conflict could inform our understanding of these systems.

Research on the Multiphasic Wilderness Experience

In their paper, Borrie and Birzell suggest that the dominant approaches to understanding wilderness experiences have followed the traditions of satisfaction, importance-performance, and benefits-based assessment of the experience. They criticize the tendency for these approaches to reduce experiences to a select number of scale items that depict motives, setting attributes or experience evaluations. Assessments of central tendency remove the individual's perspective. Survey approaches trend to be one-shot case studies that lose the dynamic (temporal and spatial) nature of the experience.

While these dominant reductionistic, group centered and reflective research methodologies have produced manageable measurement techniques, they are less helpful in producing an understanding of fundamental constructs of the wilderness experience, such as solitude. At a minimum we want to know what's lost by a management decision. A better understanding of the values that flow from wilderness experiences will assist in monitoring change. In the Mount Hood example, where much of the public has embraced the

concept of high use zones, we do not know if the importance of solitude has decreased, its definition has changed, or if there has been a substantial change in the people visiting the place. We do not know if encounter levels act as meaningful surrogates for the complex assessment of solitude offered by Hollenhorst and Jones. Does this vary by time of day, point in the trip, or from trip to trip?

To address these issues, we need more and different research focused on the "wilderness experience." This is a way to isolate what's unique about the "wilderness" as opposed to a "good" experience. What are the phases of contemporary wilderness experience and is there something unique about the experience that could be included in instruments to help understand dynamics across places and time? With a better understanding of the experience, a better understanding of the tradeoffs associated with use limits will be developed.

In their paper, Borrie and Birzell describe techniques available for this type of research. Generally qualitative in method, these approaches focus on particular moments in people's lives. People's voices are much more clearly heard and the meanings they attach to wilderness can be fleshed out. Properly collected, qualitative data can provide a deeper understanding of the wilderness experience than quantitative data.

There are several methodological obstacles to measurement of the experience. Qualitative interviews are limited by the respondent's vocabulary. There are also challenges in the degree to which results can be generalized and incorporated into management decisions. While we can get at the nature and character of the experience by talking to many people about their experience, we are unsure of the monitoring techniques that would work with this level of individual analysis. What are the characteristics of a qualitative monitoring system? Instead of focusing on the magnitude of quality, it is also important to look at responses over time and note changes in experience. How would we know if the experience has qualitatively changed? How do we best confront the relative subjectivity of various research methodologies?

Conclusions

This workshop offered the opportunity to reflect on a large body of research and ask what we are currently contributing as scientists to understanding visitor use density and wilderness experience and the application of such understanding to decisions about use limits. We recognized that with some exceptions, research relative to use limits has occurred in distinct eras. The first era was descriptive and occurred coincidentally with the aggressive application of use limit policies in the late 1960s and 1970s. Research at the time was largely focused on issues of efficiency of visitor redistribution. Recreation research in general sought an improved understanding of general wildland experience motives. In the next era, research focused on the parallel paths of defining acceptable conditions and understanding unconfined experiences. Much of this research was organized by the need to define indicators and standards within LAC type frameworks. Work on unobtrusive methods encouraged management to be mindful of the conflicts its presence could

create. During the 1980s and 1990s, the application of use limits was less common.

The sentiment of our workshop was that it is timely to embark on another era of research. Research should move beyond the spatial and temporal scales of past research and embrace the complexity of regional analysis. Tools are now available to facilitate understanding the connectivity of wildland resources in a regional context. Computer programs such as travel pattern modeling and geographic information systems can be combined with survey research to assess relationships among areas with varied policies on use density. This research should be complimented by studies of organizational barriers to regional thinking.

Similarly, increased attention should be given to understanding the individual wilderness visitor. For efficiency sake, models have been adopted to simplify the understanding of visitor experiences. The scientific and management community will benefit from the increased understanding of the experience that is emerging from hermeneutic and other experienced-based research approaches. With work, the results of these types of studies can be incorporated into management applications, complimenting the types of information being generated at other scales of analysis.

Finally, those involved in studying the social dynamics of wilderness must identify a framework for organizing a multiscale research agenda. By combining the strengths of diverse social sciences such as cultural geography, sociology, political science, and social and environmental psychology, an integrated understanding of issues as complex as those that influence use limit policy will be developed.

References

- Bradley, J. 1979. A human approach to reducing wildland impacts. In: Ittner, R., Potter, D., Agee, J., Anschell, S., eds. *Recreational impact on wildlands conference proceedings*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region: 222–226.
- Cole, D. 1981. Managing ecological impacts at wilderness campsites: an evaluation of techniques. *Journal of Forestry*. 79: 86–89.
- Cole, D. 1993. Campsites in three western wildernesses: proliferation and changes in condition over 12 to 16 years. Research Paper INT-463. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.
- Cole, D. 1996. Wilderness recreation use trends, 1965 through 1994. Research Paper INT-RP-488. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.
- Cole, D., Watson, A., Hall, T., Spildie, D. 1997. High-use destinations in wilderness: social and biophysical impacts, visitor responses, and management options. Research Paper INT-RP-496. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.
- Cordell, H.K. 2000. Wilderness in the contemporary american mind. Presentation to the Wilderness Summit, 2000. Washington, DC. May 16–17.
- Cordell, H.K., Teasley, J., Super, G. 1997. Outdoor recreation in the United States: Results from a national survey on recreation and the environment. Prepared for the outdoor recreation and wilderness assessment group, USDA Forest Service, Athens GA. And the Department of Agriculture and Applied Economics, University of Georgia.
- Hendee, J. 1974. A scientist's views on some current wilderness management issues. *Western Wildlands*. 1(2): 27–36.
- Lime, D., Buchman, R. 1974. Putting wilderness permit information to work. *Journal of Forestry*. 72: 622–626.
- Lime, D., Stankey, G. 1971. Carrying capacity: maintaining outdoor recreation quality. In: *Recreation symposium proceedings*. USDA Forest Service: 174–184.
- Lucas, R. 1989. A look at wilderness use and users in transition. *Natural Resources Journal*. 29: 41–55.
- Stankey, G., Lucas, R., Lime, D. 1976. Crowding in parks and wilderness. *Design and Environment*. 7: 38–41.
- Stankey, G., Cole, D., Lucas, R., Petersen, M., Frissell, S. 1985. The limits of acceptable change (LAC) system for wilderness planning. General Technical Report INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.
- Sumner, E. Lowell. 1936. Special report on a wildlife study in the high Sierra in Sequoia and Kings Canyon National Parks and adjacent territory. Washington, DC: National Park Service Records, National Archives.
- Wagar, J. 1964. The carrying capacity of wild lands for recreation. *Forest Science Monograph* 7. Washington, DC: Society of American Foresters.
- Wagar, J. 1974. Recreational carrying capacity reconsidered. *Journal of Forestry*. 72: 274–278.