USDA United States Department of Agriculture

Forest Service

Intermountain Research Station

General Technical Report INT-GTR-371

December 1997

Proceedings—Limits of Acceptable Change and Related Planning Processes: Progress and Future Directions

The Compilers

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Research Summary

This proceedings resulted from a workshop on Limits of Acceptable Change (LAC) and related planning processes. Workshop goals were to assess progress in applications of LAC and to work toward more successful applications in the future. Particular attention was given to concepts and terminology requiring clarification and to procedural revisions. Although initially developed to address the issue of recreation use in wilderness, the LAC process can clearly be used outside wilderness and to address issues other than recreation. Considerable attention was devoted to identifying the range of situations in which LAC can be usefully applied.

To archive experience with these processes, the successes and failures with LAC applications were described. Attendees identified the means of addressing weaknesses and discussed barriers to effective implementation. Many of these are institutional in nature and will be difficult to change. Finally, workshop attendees felt strongly that certain innovations within the LAC process could make substantial contributions to improved planning within the Federal land management agencies.

Following an introductory review of how and why the workshop was held, the proceedings contains three sections. The first section is a compilation of the papers written by workshop attendees. The second section consists of three synthesis papers written by workshop organizers, David Cole and Steve McCool. These papers attempt to describe (1) recommended conceptual and terminology clarifications and modifications to the LAC process, (2) the range of situations to which LAC can be usefully applied, and (3) lessons learned from 15 years of LAC applications. The third section is an annotated bibliography of LAC and LAC-related publications.

Acknowledgments

This publication was made possible by the collective efforts of the workshop attendees, the financial support of the Aldo Leopold Wilderness Research Institute, Rocky Mountain Research Station, the People and Natural Resources Program, Pacific Northwest Research Station, and the School of Forestry, University of Montana. We appreciate the assistance of Eric Schultz in documenting the workshop dialogue and of Karen Shanley in assisting with the annotated bibliography.

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Proceedings—Limits of Acceptable Change and Related Planning Processes: Progress and Future Directions

From a workshop held at the University of Montana's Lubrecht Experimental Forest, May 20–22, 1997

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Limits of Acceptable Change and Related Planning Processes: a Workshop

David N. Cole
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The Limits of Acceptable Change (LAC) planning framework was initially proposed in the early 1980's as a means of improving recreation management of protected areas (Stankey and others 1985). Since then, a number of related planning processes have been developed—Carrying Capacity Assessment Process (CCAP) (Shelby and Heberlein 1986), Visitor Impact Management (VIM) (Graefe and others 1990), and Visitor Experience and Resource Protection (VERP) (National Park Service 1993). These processes are similar conceptually and were developed specifically to deal with the recreation carrying capacity issue in wildernesses and National Parks. Of these processes, LAC and VERP have gained the greatest support and use among land management agencies. Throughout this proceedings we will frequently refer to "the LAC process" in a generic sense that refers to all these processes.

Since 1985, managers and researchers have gained considerable experience in the application of LAC processes to recreation management in protected areas. Evidence shows that some of the innovations contained within LAC and VERP have had a positive influence on the traditional planning efforts of land management agencies. These contributions include greater specificity to future outcomes, as well as more attention to effective public involvement. Considerable enthusiasm exists for applying these frameworks to new and innovative situations. However, problems with these processes have also surfaced, and substantial barriers to their implementation exist.

This publication presents the results of a workshop convened to evaluate and learn from experience in applying LAC processes and to suggest means of increasing the utility of these processes. Specific objectives of the workshop were to (1) document the original intent of the LAC process; (2) examine the experience gained from application of the LAC process, including its successes, its failures, and barriers to its application; (3) describe and evaluate ways that the LAC process has been modified for other purposes and by institutions other than the Forest Service; (4) assess opportunities for and barriers to extension of the LAC process beyond application to recreation issues in wilderness; and (5) suggest ways of overcoming problems with the LAC process—whether through changes in the process itself or the context in which it is applied.

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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The workshop was jointly organized by the Aldo Leopold Wilderness Research Institute and the School of Forestry at the University of Montana. It was held on May 20-22, 1997, at the University of Montana's Lubrecht Experimental Forest and included 12 invited participants. The number of invitees was kept small to encourage meaningful participation and focused discussion. The workshop was confined to individuals with substantial experience with LAC, VERP, or related processes.

Six months prior to the workshop, attendees were asked to submit a list of issues, questions, or concerns related to these processes. From these lists and their own ideas, David Cole and Steve McCool developed a paper that identified and discussed issues that might usefully be debated at the workshop. These issues were organized into three main topics: what LAC is and the extent to which its scope can be extended; operational issues with LAC; and how LAC fits within broader contexts. This "issues" paper was distributed to all participants about 3 months before the workshop. Attendees were asked to come to the workshop with extensive notes and thoughts about the ideas presented in the paper and how best to resolve some of the issues. At the same time, participants prepared papers on assigned topics. Those papers were distributed to other attendees in April. Again, attendees were asked to come to the workshop with notes and thoughts about the ideas expressed in the papers. At the May workshop, the first day was devoted to brief presentation and in depth discussions of each prepared paper. Particular attention was given to documenting the positive outcomes from LAC processes, problems experienced, means of overcoming these problems, and concepts and terminology that need clarification.

The second day and third morning were devoted to intensive discussion of a few high priority issues and questions. Considerable time was spent discussing Cole's generic model of the LAC process, stated in terminology that is not specific to recreation carrying capacity issues (Cole 1995; Cole and Stankey, this proceedings). Once refined and agreed to, this model proved useful in isolating the critical elements of the LAC process, and made it possible to better describe the range of situations to which the LAC process could be applied. Workshop participants agreed that the conceptual bases of the LAC and VERP processes were identical. They identified one substantial desirable procedural modification and suggested numerous clarifications of concept and terminology. Much of the final morning was devoted to identifying lessons learned from the LAC experience with implications for general land management planning.

This proceedings is organized in three parts. The first section, the bulk of the proceedings, consists of the invited papers prepared by workshop participants before the workshop and subsequently revised on the basis of workshop

discussions. In these papers, authors discuss the original intent behind LAC, evaluate experience with several LAC applications, describe the institutional and public context of LAC implementation, compare differences between LAC-type processes, and assess the possibility of extending LAC beyond the issue of recreation in protected areas. The second section, "synthesis papers," consists of three papers written by David Cole and Steve McCool after the workshop. These papers integrate portions of their original "issues" paper, content of the workshop discussions, and their additional ideas and opinions. The papers deal with (1) the suggested modification of the LAC process, as well as clarifications of concept and terminology; (2) extending LAC beyond recreation issues in protected areas; and (3) lessons learned about and from 15 years of applying LAC. The third section is an annotated bibliography of sources of information that might be useful to someone attempting to use an LAC or related process.

We hope that readers of this volume will gain a greater appreciation of LAC processes, their distinctive strengths, and the range of situations to which they can usefully be applied. We also hope this volume will demonstrate that LAC is not an appropriate planning framework in all situations, and will illustrate the many challenges to successful implementation of LAC. We have tried to identify these challenges and hope that many of our recommendations for dealing with them will advance the state of knowledge in applying LAC and in planning for the management of all natural resources.

References

Cole, David N. 1995. Defining fire and wilderness objectives: applying limits of acceptable change. In: Brown, James K.; Mutch, Robert W.; Spoon, Charles W.; Wakimoto, Ronald H., tech. coords. Proceedings: symposium on fire in wilderness and park management; 1993 March 30-April 1; Missoula, MT. Gen. Tech. Rep. INT-GTR-320. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 42-47.

Graefe, Alan R.; Kuss, Fred R.; Vaske, Jerry J. 1990. Visitor impact management: a planning framework. Washington, DC: National Parks and Conservation Association. 105 p.

National Park Service. 1993. Special report—VERP: a process for addressing visitor carrying capacity in the National Park System. Denver, CO: U.S. Department of the Interior, National Park Service, Denver Service Center, unpublished report. 20 p.

Shelby, Bo; Heberlein, Thomas A. 1986. Carrying capacity in recreation settings. Corvallis, OR: Oregon State University Press. 164 p.

Stankey, George H.; Cole, David N.; Lucas, Robert C.; Petersen, Margaret E.; Frissell, Sidney S. 1985. The limits of acceptable change (LAC) system for wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Invited Papers

Historical Development of Limits of Acceptable Change: Conceptual Clarifications and Possible Extensions

David N. Cole
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Abstract—The Limits of Acceptable Change (LAC) process was developed to deal with the issue of recreational carrying capacity. For that purpose, the LAC process sought to explicitly define a compromise between resource/visitor experience protection and recreation use goals. The most critical and unique element of the process is the specification of LAC standards that define minimally acceptable conditions. This paper identifies the antecedents of LAC, describes the rationale behind its formulation, and attempts to clarify LAC terminology and concepts. It assesses the extent to which a more generic LAC process might be applied to issues beyond recreation management in wilderness.

In January 1985, "The Limits of Acceptable Change (LAC) System for Wilderness Planning" was published by the Forest Service (Stankey and others 1985). In April 1987, the first application of the LAC process—to the Bob Marshall Wilderness Complex—was documented within a Forest Plan amendment. This report and plan were the culmination of an effort, begun in early 1980, to develop and implement a process for dealing with the issue of recreational carrying capacity in wilderness. The antecedents of this effort extend back at least to the 1930's when managers first stated the need to keep recreation use levels below an area's "carrying capacity" or "saturation point" (Stankey and others 1990). Since 1985, a number of related processes for addressing recreation carrying capacity have been developed—for example, the Carrying Capacity Assessment (Shelby and Heberlein 1986), Visitor Impact Management (Graefe and others 1990), and Visitor Experience and Resource Protection (National Park Service 1993) processes. Since 1985, LAC and these related processes have had a pronounced effect on recreation management planning in the United States (McCoy and others 1995) and, increasingly, around the world. Enthusiasm about these processes has resulted in calls to apply them to a broad spectrum of natural resource management issues (for example, Brunson 1995; Cole 1995).

In this paper we review the earlier work that influenced why and how LAC was developed, as well as the aspects of the process that were most controversial during its formative stages. We present this perspective partially for its historical interest but primarily to help focus attempts to (1) clarify and resolve aspects of the LAC process that remain controversial and (2) assess the extent to which LAC concepts can be applied to a wider range of natural resource management issues.

Reasons for Developing the LAC Process

During the late 1970's, we (scientists with the Forest Service's Wilderness Management Research Unit, Missoula, MT) were being asked with increasing frequency to help parks and wildernesses develop carrying capacity plans. Two events convinced us that we would shortly be deluged with such requests and that it would be more efficient to develop a process and procedural manual than to continue to deal with each request individually. In 1978, the General Authorities Act (U.S. Public Law 95-625) required each National Park to develop "visitor carrying capacities." In 1979, regulations implementing the 1976 National Forest Management Act (NFMA) specified that each National Forest wilderness would "provide for limiting and distributing visitor use of specific portions in accord with periodic estimates of the maximum levels of use that allow natural processes to operate freely and that do not impair the values for which wildernesses were created" (Federal Register 1979). Because attempts to develop carrying capacities would absorb substantial portions of the resources available for wilderness management, we were also concerned that capacities would be developed in places they were not needed and in ways that were neither productive nor defensible (Washburne 1982). The limitations of the carrying capacity concept were becoming increasingly apparent.

Another inspiration for developing LAC was our concern that recreation use was constantly growing, resulting in increasing impact and other management problems. We were concerned about the incremental nature of human-induced change in wilderness and felt that inadequate attention to management planning was a poor way to protect the investment American society had made in wilderness, through the designation process. We were particularly concerned that problems were expanding into parts of wilderness that had been relatively unused and undisturbed. This led us to attempt to isolate weaknesses in existing wilderness management planning and to devise a process that would overcome many of these weaknesses.

Perhaps our foremost concern with existing wilderness plans was the absence of specific, achievable management

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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objectives for wilderness conditions. The descriptions of desired conditions found in most management plans were so general (for example, "maintain natural conditions" and "provide solitude") as to be of no use in distinguishing problem situations, identifying promising management strategies, or evaluating management success. Only when describing desired management actions and programs were plans specific. One of the shared beliefs among those of us who developed LAC was that objectives need to be specific and achievable and that they should describe ends rather than means—conditions rather than management actions.

Other concerns included (1) lack of accountability for quality wilderness management, (2) management programs that appeared arbitrary and capricious, and (3) inadequate knowledge of both existing conditions and trends, a lack made more problematic by the frequent turnover of personnel. Without either objectives or monitoring data, the strength of management was entirely dependent on the perceptiveness and intuition of the individuals charged with wilderness management. Without either continuity of personnel or focused attention from line officers, wilderness management was typically a rudderless ship. Hence, our second shared belief was that wilderness plans should be trackable and traceable. Plans needed to provide accountability, through the specification of explicit and visible objectives that were essentially contracts, with success at meeting objectives evaluated with objective monitoring data.

Antecedents to the LAC Process

Formal development of the recreational carrying capacity concept began with Wagar's (1964) monograph on the topic. Although primarily hypothetical, Wagar's treatise forecast the two principal conclusions of the empirical research on carrying capacity that followed.

The first conclusion was that different recreationists seek different experiences in wilderness, and the relationship between amount of use and experience quality varies with the experience being sought. Similarly, the relationship between amount of use and environmental quality varies with the degree of environmental change deemed appropriate. Thus, carrying capacity could only be defined within the context of specific management objectives. Moreover, the emphasis of these management objectives should be on outputs—the experiences and environmental conditions desired—not on inputs such as use levels (Stankey and McCool 1984).

The second conclusion was that amount of use is only one of many variables that influence the quality of visitor experiences and environmental conditions. Other use-related variables (mode of travel, group size, behavior, timing of use) and environmental variables also influence quality, as does management. Management strategies can be devised that manipulate each of the variables that affect quality—not just amount of use (Cole and others 1987). Consequently, management actions other than limiting use are an equally and often more effective means of dealing with recreation management problems.

The direction we took in developing LAC, then, was largely determined by our awareness of the conceptual and empirical work on recreational carrying capacity, along with our shared belief in the need for accountable management, based on monitoring data that can be used to assess achievement of specific objectives, defined as ends rather than means. This led us to focus most of our efforts on developing a practical way to write specific objectives.

For this purpose, we again shared a belief in the concept of limits of acceptable change, first articulated by Frissell in 1963. In his masters thesis on campsites in the Boundary Waters Canoe Area, Frissell (1963) concluded that if recreation use is to be allowed, deterioration is inevitable and must be accepted. Even low levels of recreation use will cause some impact. Impact must be accepted, but "a limit should be placed on the amount of change to be tolerated. When a site has reached this predetermined limit of deterioration, steps should be taken to prevent further adverse change."

This "limits of acceptable change" concept was developed further and proposed as an alternative model for making decisions about carrying capacity (Frissell and Stankey 1972). The fundamental approach was to focus management on achieving specific objectives, defined as staying within maximum acceptable deviations from (1) the "natural range of variation" in ecological conditions and (2) a "pristine wilderness experience."

Core Elements of the LAC Process

Certain elements of the LAC process, as published in 1985, were present at the start of our deliberations and were conceptually noncontroversial; other elements were added along the way or debated extensively. We do not mean to imply that conceptually noncontroversial elements are necessarily easy to implement, however. The core, noncontroversial elements of the LAC process were the development of standards, the assessment of current conditions (inventory/monitoring) in relation to standards, and the formulation and implementation of management prescriptions to bring conditions into compliance with standards. Moreover, we always asserted that standards should refer to outputs rather than inputs. Specifically, they should define maximum acceptable deviations from absolute protection of resources (environmental conditions and visitor experiences).

We believed that the goal of carrying capacity planning was to develop a compromise between resource/visitor experience protection and access to recreational opportunities—goals that are virtually codified in the Wilderness Act and the National Park Service Organic Act. Recreation use has to be allowed, but only to the extent that is consistent with a high degree of resource protection. We also believed that the key to ensuring consistent and defensible compromises lay in formally defining those compromises as measurable, achievable standards.

Implicitly, we adopted one of many potential means of defining a compromise between these conflicting goals. The LAC process involves developing standards for only one of the goals—for protection of resources and the visitor experience but not for access to recreational opportunities. Where compromise is necessary, the goal for which standards are developed is compromised first, until the standard is reached. In the application of LAC to wilderness recreation, for example, resource conditions are compromised before recreation use is restricted—but only until standards are threatened. Thereafter, the other goal is compromised—and there is no limit to the extent it can be compromised. In the recreation application, when the maximum acceptable limit of resource degradation is reached, no more degradation is allowed and recreation use is restricted as much as necessary.

Curiously, we never debated other means of achieving compromise (such as using an iterative process—first compromise one goal a little, then the other, then the first, and so on). We also never questioned for which goal standards should be written. For example, we could have written standards for the extent to which recreation use could be restricted—rather than the extent to which resource and experiential quality could be compromised. This would have led managers to first restrict use—in an attempt to protect quality—but, once the restriction limit was reached, to not allow any further restriction of use, regardless of the implications for resource impact and experience quality. Our shared vision in these regards was probably derived from implicitly embracing the concept proposed by Frissell and Stankey (1972), as well as agency policy and much of the writing about wilderness, which generally expressed the belief that wilderness conditions should provide the "bottom-line"—not recreation use. We were also aware of a similar approach, included in the 1977 amendments to the Clean Air Act (Public Law 95-95), in which air quality was to be maintained by not allowing the violation of "standards," defined as maximum allowable incremental deviations from established baselines for "clean" air.

We conclude, then, that the most unique aspect of the LAC approach (the element that most succinctly distinguishes it from other processes and defines what LAC is) is the method used to define compromise between goals. Compromise is accomplished through the specification of LAC standards, limits of acceptable change—the LAC equivalent of attainable management objectives. Moreover, it is highly desirable that this compromise be developed through a collaborative process in which the resultant decisions reflect the input of numerous stakeholders. To be called LAC, therefore, a process must (1) contain standards that express minimally acceptable conditions, (2) require monitoring capable of determining whether or not standards have been met, and (3) base management prescriptions on evaluations of whether or not standards have been met.

Elements of LAC That Were Controversial

The elements of LAC that were debated and changed during the developmental process were zoning (the description and allocation of opportunity classes) and the identification and selection of alternatives. Neither of these elements is absolutely critical to the fundamental LAC framework. We knew that zoning was controversial. Ultimately, however, we concluded that zoning was useful in most wilderness situations, particularly as a means of guarding against the incremental degradation of conditions in the more remote and pristine portions of wilderness. Conditions will vary spatially regardless of what management does, and legitimate differences of opinion about acceptable impact levels exist. Therefore, we decided that zoning should be included as an integral part of the LAC process.

Alternatives were an attempt, added relatively late in the developmental process, to increase compatibility between the LAC process and agency land management planning processes. In addition, early versions of the process included a step in which the wilderness was divided into management areas or compartments. Ultimately we decided that this step was unnecessary; managers could add the step if it seemed useful.

There was also substantial debate about terminology. Zoning wilderness, still a controversial subject today (Haas and others 1987), was officially unacceptable in the early 1980's. Consequently, we were forced to use the terminology of opportunity classes—derived from the Recreation Opportunity Spectrum (Clark and Stankey 1979)—rather than zones. This was unfortunate because it gave greater emphasis than we intended to visitor experiences, as opposed to environmental preservation. We also added the term "indicator," well along in the process, to refer to the social or environmental variable for which standards need to be developed. The term was selected to conform with existing planning jargon. The term does not imply that the variable should be an indicator of some other variable of concern, rather than being the variable of concern iteself. Finally, the term "standard" has a different meaning than it has when used in Forest Plans.

Another controversial issue concerned whether standards could be qualitative rather than quantitative. We were unable to resolve this issue definitively. We felt that qualitative standards were vastly inferior when it came to consistently evaluating whether or not standards were violated. Conversely, we recognized that there may be extremely important variables that are impossible to quantify. We ultimately stated that standards should be quantitative wherever possible, but we have no experience in evaluating how well qualitative standards would work.

Current Controversies and Issues

The preceding discussion is germane to a number of questions about LAC. Most questions about the LAC process itself revolve around indicators and standards—what they represent, what they should include, what should happen if they are violated, and what should not happen when they are not violated. Other questions are concerned with where the concept of desirability fits in the LAC process. Finally, many questions have been raised about the applicability of LAC to a broad range of resource management issues. Many of these issues are discussed in depth in the workshop synthesis papers included in this proceedings (see papers by Cole and McCool). In this paper, we briefly address these questions from the perspective of the intent and shared belief system of those of us who originally developed LAC. This does not imply that alternative formulations are wrong. Alternatives may prove better; however, substantially different formulations might best be considered a different process.

Indicators and Standards

First, LAC standards are statements of minimally acceptable conditions. They do not define desired conditions, nor do they define unacceptable conditions. We would rather have no campsite impact, no social trailing, and virtually no interparty encounters. This is not possible, however, without restriciting use to an unacceptable degree. What is optimal about the conditions defined by standards is the compromise between opposing objectives. Given the need to

compromise between resource protection and access to recreational opportunities, standards define the *compromise* that we desire—not the *conditions* that we desire.

In wilderness, LAC standards are written for setting attributes that reflect degree of naturalness or that influence experience quality. They are not written for management actions—which are means rather than ends. They also are not written for direct attributes of the experience, because experiences are not subject to direct management control. For example, LAC standards might be written for encounter rates, a setting attribute that is subject to management control and that influences opportunities to achieve solitude (Hammitt and Rutlin 1995). Standards would not be written for solitude achievement itself (Hollenhorst and others 1994), which is determined more by personal characteristics that cannot be controlled by management.

Finally, standards are absolute limits—not just warnings. Violation of standards should not be tolerated. Tolerances can be written into standards, however. For example, encounter standards often incorporate probabilities (such as, no more than one encounter per day on 90 percent of the days during the main use season). This standard allows the one encounter per day condition to be exceeded a few times during the season—perhaps on holidays and popular weekends—without the need to invoke highly restrictive actions.

Conversely, recreation opportunities should not be restricted *to any substantial degree* unless restrictions are necessary to keep conditions within standards. This does not imply that nonrestrictive actions (such as visitor education) should not be taken at any time or that restrictive actions should not be taken when it is clear that conditions are deteriorating and standards will soon be violated if nothing is done. It does imply that managers should not implement highly restrictive actions to maintain conditions that are substantially within standards. The fact that conditions are deteriorating, but still well within standards, is not sufficient cause to restrict use substantially—although recognition of deterioration should be cause for concern and a trigger for less onerous actions. As Cole and McCool (this proceedings) note, it would be useful to explicitly list the sorts of management actions that are relatively nonrestrictive and, therefore, legitimate to implement even if standards are not threatened. A similar list of more restrictive actions would illustrate the types of actions management is committed to implementing as a means of keeping conditions within standards.

Desirability

Some have suggested that the lack of attention to desired conditions is a shortcoming of LAC. We did not include desired conditions because those desired conditions seemed so self-evident. From the Wilderness Act, conditions in wilderness should ideally include no recreation impact, settings that optimize opportunities for quality primitive experiences, and no restrictions on recreation use. With the benefit of hindsight, we agree that more explicit statements of desired conditions—for all goals, not just those we write standards for—would be a worthwhile addition to the process. These statements would help (1) with the identification of indicators, (2) with the identification and implementation of management strategies, and (3) with guidance for dealing with situations where conditions are better than acceptable but worse than desired (Cole 1995). These could easily be incorporated into the LAC process by including a section on wildernesswide goals—a proposed modification to the process discussed by Cole and McCool (this proceedings).

A Generic LAC Process

It is impossible to define the range of situations LAC can be applied to without agreement on what the LAC process is. Unfortunately, as we initially developed LAC, we decribed the LAC process entirely within the context and terminology of the issue we were concerned with—the carrying capacity problem. We never explicitly defined the process in terms that were not issue specific. This lack of explicit definition of a generic process becomes a problem when we attempt to assess the range of situations to which LAC can be applied.

Building on an effort first described in Cole (1995), the conceptual core of LAC—stated in generic rather than issue-specific terms, using the recreational carrying capacity issue as an example—is as follows:

1. Agree that two or more goals are in conflict. In the original LAC example, the two goals are to protect wilderness conditions (natural conditions and quality experiences) and to allow recreation use with as little restriction on access and freedom as possible. Other sets of conflicting goals might be allowing livestock grazing versus preserving natural conditions, minimizing property loss from fire versus allowing fire to play its natural role, and keeping air from being polluted versus allowing industrial development.

2. Establish that all goals must be compromised to some extent. LAC—a process for arriving at compromise—is unnecessary in situations where one goal cannot be compromised, such as where no compromise of the integrity of cultural sites will be tolerated. In the original example, both wilderness character and recreation use are compromised to some extent.

3. Decide which conflicting goal will ultimately constrain the other goal. Call this the *ultimate constraining goal*. The other goal is the *initial constraining goal* (because it constrains the first goal, but only initially). In the original LAC process, protection of wilderness character is the ultimate constraining goal, and recreation use is the initial constraining goal. Multiple goals can be compromised simultaneously. The only requirement is that if two or more goals are considered ultimately constraining, either these goals cannot conflict with each other or it must be possible to establish a hierarchy among these goals.

4. Write indicators and LAC standards, as well as monitor the ultimate constraining goals. In our example, this involved writing standards for such wilderness conditions as campsite impacts and visitor encounter rates. No standards are written for degree of restriction to either recreational access or freedom of behavior.

5. Allow the ultimate constraining goal to be compromised by the initial constraining goal until a "bottom line" (the limit of acceptable change) is reached. In our example, recreation use is initially allowed to compromise wilderness

conditions. Some degree of degraded wilderness condition is accepted without imposing strict restrictions on use. Use is not restricted substantially until conditions approach standards. Wilderness conditions are allowed to be degraded, as long as they are not below standard.

6. Finally, compromise the initial constraining goal so the ultimate constraining goal's minimally acceptable condition is never violated. In our example, restrict recreation use as much as needed to keep conditions from falling below standard.

Applications of LAC Beyond Wilderness Recreation Problems

If this is accepted as the generic LAC process, it suggests that LAC can be applied to any situation where (1) goals are in conflict and all goals must be compromised, (2) a hierarchy of goals exists such that one or more goals can be considered to ultimately constrain the other goals, and (3) it is possible to develop measureable standards. So the process can be applied outside wilderness and even outside protected areas. It can be applied to issues other than recreation, such as grazing, mining, water flow regulation, and emission of pollutants, as long as there is a conflict between use and resource impacts.

LAC is of little value, however, if there is no conflict between goals. If there is no conflict, one should strive for desired conditions rather than acceptable conditions. Similarly, it is of little value if managers are unwilling to compromise one of the goals. Simply strive for desired conditions for the uncompromisable goal. LAC is also unworkable—as currently formulated—if both goals are considered equally important. Finally, LAC will not work for issues where desirable or acceptable future conditions are a chaotic, moving target. This is a critical limitation where the concern is ecosystem change, where we consider natural change to be desirable, and where impacts are pervasive, leaving no undisturbed reference areas.

This discussion leads us to conclude that the LAC process—as originally formulated—can be applied much more widely than it has been. However, there are limits to its usefulness. It is not even useful for dealing with all recreation management issues in wilderness, let alone all wilderness management issues. This suggests that we should view LAC as a framework that is embedded within the larger comprehensive planning process—a framework that is extremely useful for dealing with problems such as carrying capacity that are characterised by conflict and the need for compromise.

Acknowledgments

We acknowledge the contributions of those who shared our vision during both the initial development of the LAC process, Sid Frissell, Bob Lucas, Margaret Petersen and Randy Washburne, as well as its initial application to the Bob Marshall Wilderness Complex, particularly Steve McCool and Jerry Stokes.

References

Brunson, Mark W. 1995. The changing role of wilderness in ecosystem management. International Journal of Wilderness. 1(1): 12-15.

Clark, Roger N.; Stankey, George H. 1979. The recreation opportunity spectrum: a framework for planning, management, and research. Gen. Tech. Rep. PNW-98. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 32 p.

Cole, David N. 1995. Defining fire and wilderness objectives: applying limits of acceptable change. In: Brown, James K.; Mutch, Robert W.; Spoon, Charles W.; Wakimoto, Ronald H., tech. coords. Proceedings: symposium on fire in wilderness and park management; 1993 March 30-April 1; Missoula, MT. Gen. Tech. Rep. INT-GTR-320. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 42-47.

Cole, David N.; Petersen, Margaret E.; Lucas, Robert C. 1987. Managing wilderness recreation use: common problems and potential solutions. Gen. Tech. Rep. INT-GTR-230. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 60 p.

Frissell, Sidney S., Jr. 1963. Recreational use of campsites in the Quetico-Superior canoe country. St. Paul, MN: University of Minnesota. 66 p. Thesis.

Frissell, Sidney S., Jr.; Stankey, George H. 1972. Wilderness environmental quality: search for social and ecological harmony. In: Proceedings of the 1972 national convention; 1972 October 1-5; Hot Springs, AR. Washington, DC: Society of American Foresters: 170-183.

Graefe, Alan R.; Kuss, Fred R.; Vaske, Jerry J. 1990. Visitor impact management: a planning framework. Washington, DC: National Parks and Conservation Association. 105 p.

Haas, Glenn E.; Driver, B. L.; Brown, Perry J.; Lucas, Robert C. 1987. Wilderness management zoning. Journal of Forestry. 85: 17-21.

Hammitt, William E.; Rutlin, William M. 1995. Use encounter standards and curves for achieved privacy in wilderness. Leisure Sciences. 17: 245-262.

Hollenhorst, Steve; Frank, Ernest, III; Watson, Alan. 1994. The capacity to be alone: wilderness solitude and growth of the self. In: Hendee, John C.; Martin, Vance G., eds. International wilderness allocation, management, and research. Fort Collins, CO: International Wilderness Leadership Foundation: 234-239.

McCoy, K. Lynn; Krumpe, Edwin E.; Allen, Stewart. 1995. Limits of acceptable change: evaluating implementation by the U.S. Forest Service. International Journal of Wilderness. 1(2): 18-22.

National Park Service. 1993. Special report—VERP: a process for addressing visitor carrying capacity in the National Park System. [Unpublished report]. Denver, CO: U.S. Department of the Interior, National Park Service, Denver Service Center. 20 p.

Shelby, Bo; Heberlein, Thomas A. 1986. Carrying capacity in recreation settings. Corvallis, OR: Oregon State University Press. 164 p.

Stankey, George H.; Cole, David N.; Lucas, Robert C.; Petersen, Margaret E.; Frissell, Sidney S. 1985. The limits of acceptable change (LAC) system for wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Stankey, George H.; McCool, Stephen F. 1984. Carrying capacity in recreational settings: evolution, appraisal, and application. Leisure Sciences. 6: 453-473.

Stankey, George H.; McCool, Stephen F.; Stokes, Gerald L. 1990. Managing for appropriate wilderness conditions: the carrying capacity issue. In: Hendee, John C.; Stankey, George H.; Lucas, Robert C. 1990. Wilderness management, 2d ed. Golden, CO: Fulcrum Publishing: 215-239.

Wagar, J. Alan. 1964. The carrying capacity of wild lands for recreation. Forest Science Monograph 7. Washington, DC: Society of American Foresters. 24 p.

Washburne, Randel F. 1982. Wilderness recreational carrying capacity: are numbers necessary? Journal of Forestry. 80: 726-728.

Institutional Barriers and Opportunities in Application of the Limits of Acceptable Change

George H. Stankey

Abstract—Although the Limits of Acceptable Change (LAC) process has been in use since the mid-1980's and has contributed to improved wilderness management, significant barriers and challenges remain. Formal and informal institutional barriers are the principal constraint to more effective implementation. Although grounded in a traditional management-by-objectives model, the LAC is well attuned to collaborative management. However, procedural barriers, such as the Federal Advisory Committee Act, normative beliefs regarding relevant knowledge and power sharing, and structural barriers, such as compartmentalization and institutional capacity, constrain effective application of LAC to wilderness and recreation settings as well as other resource management issues for which it is potentially well suited.

Natural resources management takes place within a tightly proscribed set of formal and informal norms. At the formal level, various codified rules—laws, policies, planning protocols—shape and direct actions. At the informal level are a variety of normative influences, internalized and reinforced through influences such as the educational process and the sanctions that organizations, supervisors, and peers employ. Indeed, the cultural basis of these norms makes recognition of their influence difficult and modifications of resulting behaviors problematic.

Some norms are both formal and informal. For example, a strong belief in, and reliance upon, rationality, science, and objectivity are cornerstones of modern scientific forestry (Wondolleck 1988) and embedded both formally (such as, NFMA, NEPA) and informally (such as, by virtue of how we approach problem solving). Such broadly grounded norms result in profound impacts on how we define problems and the ways we organize to solve them.

We were concerned with such issues in the development of the LAC planning framework. The LAC derived from traditional comprehensive-rational origins, consistent with a "management by objectives" (MBO) approach featuring rational and scientific approaches to identification of issues, inventory, identification of alternatives, evaluation, implementation, and monitoring.

The problem of managing recreation use and impact has long occupied attention but it has been a special concern in wilderness, given the emphasis on protection of natural processes and conditions in such areas. In response, both managers and researchers have relied upon the concept of carrying capacity as the basic framework within which the problem was framed.

A major "driver" underlying development of the LAC was a realization that the carrying capacity model simply didn't work. Many reasons could be cited for this, but a key concern was that the model tended to frame the problem of managing recreation use and associated impacts—social and resource—in technical, mechanistic, and formula-driven terms (Stankey and McCool 1984) rather than as a problem involving value judgments about appropriate types and levels of use and their management. Two changes were seen as needed in any alternative conception. First, we needed a conceptual framework that would help managers and researchers think about the problem as a socio-political, rather than technical, problem. Second, we needed to identify and evaluate new forms of collaboration among managers, scientists, and citizens to deal with the underlying capacity issues.

The LAC framework was a response to the first need. Predictably, the historical attachment to the carrying capacity model proved (and continues to be) difficult to overcome. In part, this likely stems from a conception of carrying capacity, grounded in its central role in fields such as range and wildlife management, as an objective, quantifiable, and scientific framework. At least in theory, carrying capacity offered a rational, science-grounded model consistent with prevailing normative concepts as to how, upon what bases, and by whom decisions about recreation use levels should be made. Thus, we faced a struggle in communicating the limitations of the capacity model because any criticisms challenged core values and beliefs held by managers and reinforced by organizational policies and practices. But as formidable as this challenge was, it was neither the most difficult nor the most important contribution of the LAC, especially as applied in the Bob Marshall Wilderness Complex.

What became apparent early on was the need to recognize the significant, even predominant, political component of establishing limits on the use of public resources and the associated development of management strategies to implement those limits. Ultimately, the underlying questions of limitation, regulation, and management involved *choices:* about values (such as recreation use versus environmental protection), about the distribution of those values (such as, who gains versus who pays, such as between private and commercial users), and about the means through which the distribution of those benefits and costs were achieved (such as, use limits, campsite closures).

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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This recognition challenged our response to meeting the second need: How should we organize to implement the LAC? In other words, what were the appropriate institutional arrangements for undertaking the task before us? If the LAC represented, at least hopefully, a new way of thinking about the carrying capacity issue, it followed that there would be a need for new mechanisms, processes, and structures for implementing such a "new" approach. However, the extent to which such mechanisms, processes, and structures were in place, or for which adequate models existed from which we might work, was problematic. In retrospect, I don't believe we fully appreciated how important the development of new approaches was or the kinds of barriers that we would need to overcome.

Following the original work of John Friedmann (1981) and the adaptations of his work to natural resource management settings by McLaughlin (1977) and Stokes (1982), we adopted the transactive planning model as the basic framework around which collaboration would be undertaken. The central thesis of the model argued that dialogue ("transactions") among stakeholders was a necessary component of any planning exercise. As described in the issues paper elsewhere in these proceedings, the technical planning process of the LAC was "married" with the transactive planning model as a means of carrying out the process.

Whether this was a "marriage" made in heaven or one conducted under the auspices of a shotgun remains arguable. What is clear is that it was an unusual union. The LAC was an unadulterated child of social reform planning, rooted in science, rationality, and objectivity. The transactive model derived from an emergent planning tradition Friedmann (1987) calls "social learning". In retrospect, it was a union designed to deal with what Pierce and Lovrich (1983, p. 1) have described as the "technical information quandary": "how can the democratic ideal of public control be made consistent with the realities of a society dominated by technically complex policy questions?"

The transactive model represented a collaborative approach; an institutional structure within which complex environmental management problems could be addressed. This, of course, is a generic challenge facing resource management organizations today. It has implications for the LAC in both the recreation/wilderness settings in which it was applied originally and to efforts to apply it beyond such settings.

Below, I summarize three institutional models of collaboration and relate these to the approach used on the Bob Marshall Wilderness Complex. I then turn to some of the constraints such alternative models face, not only for future applications, but other planning models and approaches as well.

Three Models of Collaboration

In a review of large-scale ecological assessments, Westley (1995) proposes three types of collaborations; *planning-led*, *visionary-led*, and *learning-led.* Each has certain strengths and weaknesses relative to four fundamental tasks: issue definition (defining the problem), action mobilization (empowering people to act), resource mobilization (bringing money and people to bear), and structuring (developing institutions, structures and processes for action, such as rules, norms, and terminology).

Planning-led collaborations often are a component of, or mandated by, government, such as commissions or task forces. They typically possess considerable ability to mobilize resources and usually are characterized by well-defined processes and structures. On the other hand, their capacity to develop adequate and comprehensive measures of underlying issues and questions can be compromised by a rush to premature closure to avoid political scrutiny. They also suffer from limited capacity to mobilize constituents; such as, citizens, who because of cynicism or lack of energy, are unwilling to engage.

Visionary-led collaborations often are stimulated by, and built upon, charismatic individuals. Their use of symbols to capture attention and mobilize resources and action, coupled with intense personal involvement and commitment, lend such groups special capacity. But while strong at issue definition, they are "notoriously bad" at the institutional tasks necessary to see the job through. Ironically, the qualities of independence and creativity that define such groups, tend to operate to their detriment when it comes to developing structures and routinized processes.

Finally, learning-led collaborations emerge from what Westley calls a "groundswell of concern"—the independent reactions of people to a particular issue or problem that eventually coalesce. Starting at the individual level, actions flow outward; such groups have a highly developed emergent quality. They have a well-developed capacity to define issues and are well-suited to developing constituent support. However, given their idiosyncratic nature, they often lack resources and structures that facilitate implementation and legitimization. This can handicap their long-term effectiveness; such as that these collaborations might exist only a short time, making on-going negotiations with established institutions problematic.

As we think about the kinds of institutional structures and processes that facilitate, or constrain, application of the LAC, we need to capitalize on the relative strengths of each collaborative type, while minimizing their respective weaknesses.

For example, the issues paper by Cole and McCool in these proceedings suggests inadequate debate among those of us who developed the LAC concerning the relative merits of "recreation use" versus "environmental protection" goals. This is clearly part of the issues definition stage and is critical. However, getting the question(s) right is always problematic. Differing constituents, driven by differing agendas, perspectives, concerns, and knowledge, mean that the issue definition stage must be broad and inclusive and avoid premature closure.

Being inclusive and comprehensive is important because successful resolution of complex environmental problems requires extensive interaction with others. For example, the relevant knowledge needed to resolve complex problems is distributed widely among various groups and individuals (Lang 1990). However, normative conceptions of what constitutes "relevant" knowledge and even who is capable of holding such knowledge are often tightly proscribed as solely the domain of science and experts; "knowledge" held by local residents, users, and so forth is seen as undocumented and anecdotal and thus inappropriate input to technical

discussions. Such views constrain social learning among participants in any collaboration; they are also inimical to development of trust and credibility (Moore 1995).

In summary, effective implementation of resource management in general, and the LAC in particular, increasingly requires collaborative structures and processes. Although not explicitly recognized at the time, the Bob Marshall Task Force manifested many of the characteristics cited by Westley. Visionaries helped refine our sense of question and direction. Scientists and technical specialists helped build understanding and support. Organizational planners and managers provided essential resource mobilization, follow-through, and organizational infrastructure that turned vision into reality.

Barriers to Collaborative Planning

Given such a typology of collaborative types, what are the key institutional barriers that thwart or stymie their implementation? I contend that institutional limitations are likely the most severe constraint on effective implementation of the LAC (or any other planning framework; see Slocombe 1993; Grumbine 1994). As Thompson and Tuden (1987) argue, institutional structures must be matched with the extent to which agreement exists about both preferred social goals and causal relationships. When disagreement on both goals *and* causation exist, the appropriateness of bureaucratic structures and comprehensive-rational planning models is problematic. Yet, they continue to dominate the institutional landscape, maintained, at least in part, by the assumption that the lack of success is due to deficiencies in application rather than to a fundamental mismatch between problem and process and to the systemic nature of the changes confronting resource managers (Caldwell 1990).

In thinking about natural resource management agencies and their struggle to adopt new approaches and techniques for dealing with complex resource management questions, I see three types of barriers: *procedural barriers*, *normative barriers*, and *structural and process barriers*.

Procedural Barriers

Procedural barriers include formally codified rules of conduct that regulate organizational and individual behavior. Some are grounded in law, others in organizational policies. An example is the Federal Advisory Committee Act (FACA). Although law since 1972, it only gained recent attention when used as the basis for lawsuits appealing the Northwest Forest Plan developed through the Forest Ecosystem Management Assessment Team (FEMAT) process in the Pacific Northwest.

The FACA was designed explicitly to constrain agencies from inappropriately excluding certain public interests from decisionmaking, a move most would support. However, it is important to understand that while FACA was structured to *impede undemocratic participation*, it was not structured to *foster democratic participation* (Nuszkiewicz 1992). Ironically, FACA has, in many ways, fostered the very conditions that it sought to control (that is, undemocratic representation) For example, the Bob Marshall Task Force was probably in violation of FACA. Although the act contains provisions to charter advisory groups, the process is formula-driven and mechanistic.

The FACA has operated to dampen development of creative advisory and consultative groups; more worrisome, it has provided a legal pretext upon which those who have never been supportive of the value of public consultation can turn to as justification for not pursuing creation and use of such groups (this links with another category of barriers—normative—to which I turn next). One result is that agencies lose access to learning-led and visionary-led collaborations that might otherwise be available.

Normative Barriers

Institutional-grounded constraints we label as normative stem from fundamental beliefs about such matters as the role of experts and science, the locus of power and control, and the nature of knowledge. Although normatively based constraints are often informal, their influence is profound and highly resistant to change.

The roots of such constraints are grounded largely in the educational and socialization processes through which natural resource professionals are trained and acculturated. For example, normative conceptions of relevant knowledge derive from the positivist-traditions of western science and reinforce the predominant value of data characterized by objectivity, replicability, and quantification (Bryant 1985). Clearly, such a way of knowing the world is important. However, there is a growing recognition of, and appreciation for, other forms of knowing, especially what is called experiential, personal, or indigenous knowledge (Friedmann 1987). This is the knowledge gained by those who live, work, and play in natural resource settings and can provide important and valuable insight as to processes, history, and outcomes.

But when the knowing that derives from formal scientific knowledge confronts that derived from indigenous or experiential knowledge, problems can develop. Scientists and other technical specialists find it difficult to admit indigenous knowledge as authentic or as relevant or useful to discussions—for example, about the establishment of indicators and standards or an assessment of the consequences of alternative management techniques. But the failure to acknowledge such knowledge carries certain liabilities. First, it can impoverish the information base with which we have to work in dealing with complex problems and uncertain outcomes. Second, it can contribute to the adversarial nature of deliberations, in the form of arguments as to whose "truth" is true. What suffers in the end is the perceived credibility of both those who advance such alternative forms of knowledge as well as those who deny it.

Such a constraint has implications for collaborations between planning-led types and those of a visionary-led and learning-led orientation. Visionary-led groups might possess limited technical or scientific understanding of the processes underlying issues of concern, leading to the purposeful or inadvertent dismissal of their knowledge and concerns on the grounds they "don't understand the facts." Learning-led groups often join people from disparate orientations and perspectives, who share common concerns, but with varying forms of knowledge motivating their interest. Again, it can be easy to dismiss those whose knowledge is not framed in conventional and traditional forms.

A related normative issue relates to the issue of control and power. A recurring issue in discussions about applications of the LAC and, especially, with regard to the use of the LAC within some kind of social learning framework, such as transactive planning, can be summarized by the question "who makes the final decision?" A common belief is that what constitutes an abdication of responsibility is the act of broadening the forum of discussion and inviting wider participation in not only the execution of the mechanics of the LAC process (such as, selecting indicators, defining standards), but also in the actual process of selecting an alternative. In more extreme situations, we have encountered technical staff and scientists who see such participatory forums as detracting from their power and influence upon eventual decisions.

This is not an entirely inaccurate perception. Cortner and others (1996, p. 10) point out that "Changes in institutions mean changes in the location of control. Sharing decisionmaking with citizens may lessen the influence of technical experts; this raises concerns about loss of power …people fear (loss) of jobs, prestige …learning disrupts the comfort of standard operating procedures."

Overcoming such concerns is a key institutional challenge. In part, it must involve recognition of a central political reality; power, in the political sense, has always resided in the wider body politic, not within administrative organizations. What agencies, such as the USDA Forest Service or USDI Bureau of Land Management, hold is *authority*, which is a form of legal power delegated to them through the political process and by society (Potapchuk 1991). Agencies and the staff within them clearly hold certain authorities and, indeed, cannot abdicate that authority short of violating the law. However, such authority ultimately derives from the power held by the wider society and accorded to the organization. And what has been accorded can also be withdrawn. Thus, what is commonly perceived as a "loss of power" is, in fact, not true; rather, it reflects a re-establishment of the appropriate power relationships between government and the society it serves.

However, beyond the political theory, the kinds of concerns spawned by new relationships and roles of society, resource managers, and scientists cannot be ignored. The search for institutional structures and processes that inform, promote learning, and encourage thoughtful deliberation remains a major challenge (Lee 1993).

Structural and Process Barriers

A third category of institutional constraints derive from organizational structures and processes. Their influence on interaction and cooperation, the various sanctions, incentives, and disincentives they impose, and the way they shape, direct, and channel knowledge, resources, and influence profoundly affect organizational and individual behavior. There are numerous examples of such influences. In the following, I examine two specific examples: compartmentalization and institutional capacity.

Compartmentalization—At a broad level, the separation of research and management in the Forest Service is a classic example of compartmentalization. Although valid reasons underlie this separation (such as, to protect scientific integrity), this structural feature influences how these branches interact (or fail to do so). In the Bob Marshall project, this potential constraint was overcome through the initiative and action of individual National Forest managers and researchers, and their academic colleagues. In this sense, the group was an example of learning-led collaboration.

Yet, as noted earlier, such relationships often are idiosyncratic and isolated. The incentives for such joint ventures are not clear and, indeed, in some ways there are overt disincentives for such collaborations. The continuing debate in the research community regarding appropriate measures of output and productivity (such as, role of refereed articles as opposed to involvement in applications) reflects the uncertainty of the value of such collaboration to researchers. Similarly, it is not at all clear what incentives exist for managers to undertake the initiative to collaborate with research; to the extent such collaborations lead managers to be involved in promoting and supporting experimentation, where "success" is problematic, there might be clear disincentives (Lee 1993).

More subtle, but perhaps more insidious, are the biases for bureaucracies to *compartmentalize* actions and responsibilities. In this framework, we find separation founded on disciplines (such as, wildlife, engineering) or tasks (such as, planning, public involvement). An especially revealing example is the distinction between "planning" and "management." Here, there is a separation between the processes to decide what should be done and those that implement. It also promotes a conception of a linear, unidirectional path of progress; such as, after going through a process of problem definition and scoping, we turn to planning, after which, we move onto management, then to monitoring, and so on.

This is an unproductive conception. In the analysis of issues reported elsewhere in this proceedings, a central weakness attributed to the LAC process was that "planning takes too long." However, planning needs to be seen as an ongoing process of implementation, evaluation, and modification; indeed, this is the core of adaptive management (Lee 1993). Both the problems that a process such as LAC focuses upon, as well as the institutional environment within which planning occurs, change. A compartmentalized view of planning, under these conditions, is dysfunctional and virtually ensures the failure of resulting actions.

A significant lesson of the LAC process in the Bob Marshall was how it revealed the flaws and liabilities of compartmentalization. The presumption that planning and management can be somehow decoupled fails to acknowledge the need for continuous feedback, evaluation, and revision. By treating these as separate activities, two significant costs can be incurred. First, the assumptions, context, and rationale for many choices made during the planning phase can be lost or misunderstood. Second, the learning that derives from management implementation can fail to inform planners, so that the learning from applications is lost. Actions and structures that suppress learning warrant special attention; learning represents an alternative to crisis because it introduces into organizations inconsistencies that challenge convention and the conclusive nature of existing ideologies (Westley 1995). Moreover, the failure to be responsive to contradictory signals from the wider sociopolitical environment can be the first step on the road to oblivion.

The distinction and separation of management and planning (and research) also operates to break down the close linkage between knowledge and action. There is an increasing appreciation of the iterative linkage between these concepts, found in the writings of Friedmann ("from knowledge to action" is the subtitle of his 1987 text), Lee (1993) (the core of adaptive management is that action produces knowledge), and Westley (1995) who points to the discontinuities between knowledge from action (management) and planning as dysfunctional.

Rather than a set of compartmentalized functions and activities, there is a need to view the enterprise as a kind of seamless whole. In such an integrated setting, the various activities undertaken inform all others and there is an opportunity for real-time learning, adjustment, and evaluation. This is particularly the case when managing ecosystems (including people); the need to break away from the reductionist and functional-based orientation of the past is at the heart of the growing interest in adaptive management.

However, this is also a case where "saying" and "doing" are two different things. A variety of forces thwart efforts to approach resource management in a more integrative fashion, including structural issues such as budgeting systems and functional organizations. Normative issues of power and control are also involved, both within management organizations, between management and research, and between the bureaucracy and the wider citizenry.

Institutional Capacity—Another type of institutional barrier that our experience in applying and evaluating the LAC process has revealed relates to institutional capacity. Institutional capacity describes the ability of an organization to mobilize the necessary resources—intellectual, fiscal, staff—needed to achieve its objectives. When necessary capacity is lacking, the ability to deliver desired programs, to operate efficiently and effectively, and to secure public understanding and support are all compromised.

A specific illustration in the case of the LAC (as well as other planning frameworks) focuses on the need for constant reinoculation of the management organization of the details and rationale of the LAC process as well as relevant empirical knowledge regarding social and biophysical research. Inadequate mechanisms and processes to ensure institutional memory lie at fault here; these are exacerbated by personnel policies that lead to turnover among managers and by research evaluation criteria that neither adequately nor appropriately reward research staff who consider engaging in such activities.

Collectively, these conditions promote a situation in which learning and experience are lost over time and with the movement of people. The detailed but often undocumented learning that inevitably occurs in a planning effort, such as the Bob Marshall project, is especially vulnerable to inadequate institutional memory. Not only is knowledge of place lost, but also knowledge of process; this includes the rationale, assumptions, and other types of information that accompanied development and application of the planning effort and that are key to successful adaptation elsewhere.

The kinds of relationships developed among members of various collaborative undertakings, often requiring significant commitments of time, are lost as people move; the lack of any formal mentoring to ensure transitions over time means that we virtually start from scratch as an individual leaves and is replaced by another.

Inadequate institutional capacity is often associated with the lack of adequate fiscal resources. However, money is an example of a necessary but not sufficient resource. More critical are structures and mechanisms that capture, retain, and accurately transmit knowledge of place and process. When such structures and mechanisms are lacking, the strengths of any planning process, such as the LAC, are greatly reduced.

Conclusions

Overcoming these various barriers will not be easy. However, a key first step is identifying and acknowledging them. It is also important to consider where the problem lies and what might be done in the short-term versus long-term. For example, addressing procedural barriers might prove difficult in the short-term, especially when the barriers are institutionalized as law (such as, FACA). However, one strategy is to help clarify and dramatize how these barriers act to constrain and limit the political process. By activating awareness and understanding of key constituents, who are empowered to act in the political arena, it might prove possible to alter even deeply entrenched legal barriers.

Internally, there is a need for increased focus on incentives for people (managers and scientists) to work across the boundaries that currently separate them. The Bob Marshall Wilderness Complex Task Force, as noted earlier, exemplified a "learning-led" collaboration, with key individuals from the Forest Service (management and research) collaborating with academic colleagues and citizens. It fostered creative and innovative actions on the ground, based on the best available knowledge. It helped frame key research propositions and hypotheses, as the limits of knowledge were challenged by both managers and citizens. And it did much to create an overall learning environment that produced enhanced levels of understanding and trust among participants.

Overcoming institutional barriers is difficult, if for no other reason than that they are literally a part of us. They derive from the way we learn, act, and organize, and to recognize them, let alone challenge them, is hard. Yet failure to do so risks obsolescence and irrelevance. Being open to challenges about our way of thinking is the first step to developing responsive alternatives (Westley 1995).

References

Bryant, Christopher G. A. 1985. Positivism in social theory and research. New York: St. Martin's Press. 214 p.

Caldwell, Lynton Keith. 1990. Between two worlds: science, the environmental movement, and policy choice. New York: Cambridge University Press. 224 p.

Cortner, Hanna J.; Shannon, Margaret A.; Wallace, Mary G.; Burke, Sabrina; Moote, Margaret A. 1996. Institutional barriers and incentives for ecosystem management: a problem analysis. Gen. Tech. Rep. PNW-GTR-354. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; 35 p.

Forester, John. 1989. Planning in the face of power. Berkeley: University of California Press. 283 p.

Friedmann, John. 1981. Retracking America. Emmaus PA: Rodale Press. 484 p.

Friedmann, John. 1987. Planning in the public domain: from knowledge to action. Princeton: Princeton University Press. 501 p.
Grumbine, R. Edward. 1994. What is ecosystem management? Conservation Biology. 8(1): 27-38.
Lang, Reg. 1990. Achieving integration in resource planning. In: Lang, Reg, ed. Integrated approaches to resource planning and management. Calgary, AB: The University of Calgary Press: 27-50.
Lee, Kai N. 1993. Compass and gyroscope: integrating science and politics for the environment. Covelo, CA: Island Press. 243 p.
McLaughlin, William J. 1977. The Indian Hills experiment—a case study in transactive planning theory. Fort Collins, CO: Colorado State University. Dissertation.
Moore, Susan A. 1995. The role of trust in social networks: formation, function, and fragility. In: Saunders, D. A.; Craig, J.; Mattiske, E. M., eds. Nature conservation 4: the role of networks. Chipping Norton, New South Wales, Australia: Surrey Beatty and Sons: 148-154.
Nuszkiewicz, Michelle. 1992. Twenty years of the Federal Advisory Committee Act: it's time for some changes. Southern California Law Review. 65: 920-967.
Pierce, John C.; Lovrich, Nicholas P. 1983. Trust in the technical information provided by interest groups: the views of legislators, activists, experts, and the general public. Policy Studies Review. 11: 626-639.
Potapchuk, William R. 1991. New approaches to citizen participation: building consent. National Civic Review. (Spring): 158-168.
Slocombe, D. Scott. 1993. Implementing ecosystem-based management. Bioscience. 43(9): 612-623.
Stankey, George H.; McCool, Stephen F. 1984. Carrying capacity in recreational settings: evolution, appraisal, and application. Leisure Sciences. 6(4): 453-474.
Stokes, Gerald L. 1982. Conservation of the Blackfoot River Corridor—an application of transactive planning theory. Fort Collins, CO: Colorado State University. 229 p. Dissertation.
Thompson, James D.; Tuden, Arthur. 1987. Strategies, structures, and processes of organizational decision. In: Thompson, James D.; Hammond, Peter B., Hawkes; Robert W.; Junker, Buford H.; Tuden, Arthur, eds. Comparative studies in administration. New York: Garland Publishing Company: 197-216.
Westley, Frances. 1995. Governing design: the management of social systems and ecosystem management. In: Gunderson, Lance H.; Holling, C. S.; Light, Stephen S., eds. Barriers & bridges to the renewal of ecosystems and institutions. New York: Columbia University Press: 391-427.
Wondolleck, Julia M. 1988. Public lands conflict and resolution: managing National Forest disputes. New York: Plenum Publishing Company. 263 p.

Role of Public Involvement in the Limits of Acceptable Change Wilderness Planning System

Ed Krumpe
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Abstract—Implementation of the LAC within politicized contexts requires that managers/planners involve the public in ways significantly different from the traditional rational-comprehensive paradigm of natural resource planning. In politicized contexts, the lack of clear agreement about goals and disagreement among scientists about cause-effect relationships requires planning to be collaborative and learning oriented. LAC makes the value-laden nature of protected area management decisions explicit; involving the public ensures that the variety of values involved are revealed. Transactive planning is an approach, based on dialogue and mutual learning, that provides an effective framework for developing LAC-based plans.

The LAC planning system represents a rational, science-based planning process articulated in the implementation of indicators, standards, and monitoring applied across different opportunity classes within Wilderness. As originally conceived, LAC was concerned primarily with resolving the conflict between the mutually competing goals of preserving wilderness conditions while ensuring unrestricted access to high quality wilderness recreation experiences. It was the epitome of a rational-comprehensive approach to planning in protected area settings in that it presented a process based on a specific sequence of steps, much of the information for which came from scientific and technical sources. LAC was broadly representative of how natural resource management agencies approach planning. In actual practice, however, the application of the LAC process has been deeply intertwined with substantial public involvement. In this paper, we give the rationale for the elevated role of public involvement in the LAC process and outline how public involvement has become integrated with protected area planning.

Traditional natural resource agency approaches to public participation have often been constructed upon procedural and adversarial views of the process. Public participation is a requirement of the National Environmental Policy Act, the National Forest Management Act, and for studies of wilderness suitability, the Wilderness Act. Such legislation imposed upon land management agencies a duty to inform the public, identify issues, and gather responses to agency defined alternatives. Often, this duty was carried out in a series of informational meetings that regularly led to confrontation over proposed actions. The public tended to be leery of agency-led meetings, many of which were engineered to comply with procedural requirements but left little opportunity for interaction and discussion. While the public often voiced its views, the public was not part of the planning process.

In a real sense, with this conception of planning as engineering, the public was not qualified to engage as an equal participant in the process because it did not hold technical competencies to proceed or contribute in a constructive way. Planning had been captured by technocrats, and was viewed as a set of procedures or protocols for developing the best route to a desired end. When planning is conceived as engineering or modeling, only those with the relevant credentials may engage.

This model of planning had several other distinctive drawbacks, one of which is that such approaches to planning often led to stalemates and a lack of action—a problematic paradox if planning is viewed as "linking knowledge to action" (Friedmann 1987). If planning is viewed as a series of interventions into anticipated history, gridlock is catastrophe. A second effect was to discount and neglect experiential knowledge held by the public. Such knowledge comes in the forms of anecdotes, emotions, and informed "common sense." Experiential knowledge can inform the planning process of what issues and questions are socially relevant and the political acceptability of alternatives. It may complete gaps in knowledge about specific places. Its presence may increase the quality of discussion. Science alone is not an adequate basis for social action. Such action requires that society understand and accept the technological guidance suggested by science, and find that it is not only socially acceptable but culturally appropriate and economically feasible. Such findings require the "working through" that Yankelovich (1991) suggests is fundamental to generating informed public judgment.

The approach to planning and public participation for the first full application of LAC was paradigmatically different from past forms. LAC was married with a transactive approach to planning (Friedmann 1973) that involved using a citizen task force to interact on equal footing with agency managers and scientists to produce the plan (McCool and Ashor 1984; Stokes 1990). Transactive planning is built upon the concepts of dialogue and mutual learning as prerequisites to effective societal action—the plan. Friedmann designed transactive planning as a response to the failures of traditional rational-comprehensive planning in urban settings. Transactive planning is built upon the assumptions

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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that (1) action in society requires multiple actors in multiple roles and (2) both scientific (processed) knowledge and personal (experiential) knowledge are required for effective action. However, the difference in perspectives and knowledge held by scientists and various publics leads to a "gap in knowing" that can only be overcome through a series of face-to-face interactions (transactions). Friedmann envisioned small working groups of individuals facilitated by professional planners developing solutions to neighborhood issues and problems to clear this gap.

Each individual representing a specific interest, brings to the process a particular type of expertise and knowledge that is required for effective action. Through the dialogue that is fundamental to mutual learning, plans are crafted that incorporate a series of compromises and collaborative solutions (mutually accepted transactions). This approach was initially tested in an outdoor recreation planning situation by both McLaughlin (1977) and Stokes (1982), and since has been used successfully in a number of wilderness management plans (see McCoy and others 1995). In each case, working groups of citizens, managers, and sometimes scientists, collaborated to produce a recreation management plan for the wilderness. This type of planning represents a level of public involvement not generally found elsewhere in the Forest Service or other Federal land managing agencies. The question arises, why has such a systematic, science-based process as LAC become intertwined with an apparently ambiguous, often-times controversial process as public involvement and transactive planning using citizen working groups?

The answer is threefold. The need for public involvement, beyond complying with procedural requirement of various environmental legislation, is shaped by (1) the nature of the problems confronting wilderness managers, (2) the changing societal situations that affect virtually all areas of natural resource planning, and (3) the value-laden and judgmental character of decisions involved in protected area planning.

Nature of the Problem LAC Addresses

LAC was conceived as a process to resolve conflict between the goal of providing unrestricted opportunities for wilderness recreation use and the goal of preserving wilderness conditions. In practice, we have learned that these goals are neither clearly understood nor is there, commonly, clear agreement about them. Their interpretation is open to a host of definitions and their potential resolution is likewise not straightforward. That is, the original authors of the LAC planning system assumed that the desired conditions of wilderness (pristine conditions, freely functioning natural processes, no intergroup conflict, no access or behavioral restriction, and so forth) were so obvious that there was no need to state these desired conditions explicitly. In reality, the Wilderness Act of 1964 is a product of compromise hammered out over 8 years of political wrangling; much of the act's language (such as, "outstanding opportunities for primitive and unconfined experiences") is still subject to different and conflicting interpretations by a variety of interest groups when discussing management of individual Wilderness areas.

Debate over the ultimately constraining goal—how wild should the Wilderness be?—characterizes many wilderness planning processes. The potentially varying interpretations of this goal require that they be brought into the dialogue so that learning may occur. While the presence of dialogue may seem to make the task of writing standards for the ultimate constraining goal (wildness) difficult, it is only so because an attempt is being made to identify values explicitly during the LAC process (so they can be consciously appraised) rather than following publication of draft alternatives where the only recourse may be judicial review. The disagreement over goals suggests that science may play a significantly different role in planning than in settings where there is agreement. In settings of disagreement over goals, the primary planning approach will be one of negotiation and compromise (Thompson and Tuden 1987); science is limited in its capacity to indicate the most appropriate goal.

To complicate matters, many protected area management organizations face planning settings where there is not only little agreement about goals, but often scientists disagree about cause-effect relationships (Thompson and Tuden 1987). For example, there is often widespread disagreement over whether stocking game fish, or even recreational harvesting of fish, has a detrimental effect on the naturalness of wilderness conditions. Similar disagreement exists over goals and over cause and effect relationships concerning the use of pack stock, technical climbing (using bolts), airplane and powerboat access and their effects on biophysical attributes and conditions. In these situations, problems confronting managers are more "wicked" (Allen and Gould 1986) than "tame" (King 1993). Many of these problems could be termed "messes" (after Ackoff 1974) because they represent systems of interrelated problems. Messes and wicked problems demand more in the way of public participation and learning in their resolution (because resolution of the problem is more a function of negotiation than data collection and analysis) than tame problems, where rational-comprehensive approaches excel. Rational-comprehensive approaches work well for tame problems because there is usually only one goal for which a consensus exists, and solutions are a function of engineering not negotiation.

Societal Context in Which LAC Planning Takes Place

The second rationale for the need for public involvement in LAC planning results from the social and political context within which planning takes place. We make the proposition here that most wilderness planning takes place within politicized contexts, that is, social systems where a variety of groups vie and compete for power to implement actions they feel are needed for the broader social interest. Government agencies in this context play the role of carrying out actions that interest groups feel are needed, once those actions receive a Congressional or legislative sanction. In a politicized setting, the bestowed legislative power or authority to conduct planning and make decisions on what courses of action are preferred is distinct from the political power or

authority to implement plans. In essence, interest groups and individuals outside the agency hold veto power over plan implementation.

Historically, wilderness management agencies (Bureau of Land Management, National Park Service, USDA Forest Service, and U.S. Fish and Wildlife Service) have held monopoly power over both planning and plan implementation. The New Deal model of government instituted in the Roosevelt era was that government agencies represent the public interest (McGarity 1990) in planning and implementation of social programs. However, because of mismanagement (both real and perceived), changing social conditions, shifts in demands from government, increased social fragmentation and conflict, the legal powers to conduct and implement plans have not only become distinct, they have separated. In these situations, two conditions are required for effective planning. First, a technically sound planning process is required for explicitness and facilitates the search for reasonable alternatives by systematically stepping through a logical sequence. Such a process is also based on accepted objectives and is understandable. LAC provides this framework.

Yet the above condition is only a necessary, but not sufficient, condition for effective planning. We now know that we also need a consensus among those affected by the plan about the proposed course of action. This second need is essential in politicized settings. In politicized settings, the values in conflict are often well articulated, expressed, and pursued by the various contending groups. The arena of conflict expands, contracts, shifts, and moves, but encompasses the agency and its perceived mission. One or several groups may in reality hold the power of implementation rather than the planning agency. This power, held in the political realm, may be termed "the power of veto." There may not be recognition of this by planners: "We have the legal authority, so let's do it."

Because interests are well defined, wilderness plans will likely negatively impact some value or interest represented by an articulate and outspoken group—one that often holds veto power. Good plans—those that specifically state objectives and standards—may thus create more in the way of disagreement than agreement because the process of establishing standards and identifying actions makes explicit their effects on one's interest. As a result, the planner and wilderness manager become frustrated that politics comes in the way of rational planning, that decisions are motivated more by political considerations than by purely biological or philosophical ones, or by considerations of fairness, equity, or any number of other idealized values they would hope would guide the management of publicly held natural resources. The citizen, on the other hand, is equally frustrated at the significant effort going into planning that results in no change, or in plans not addressing the needs of a particular interest, or because plans are unrealistic, costly, or result in significant, long-lasting environmental and social impact. In a sense, there is a breakdown in the linkage between knowledge and action forming the basis for Friedmann (1987).

The only way around this situation is to (1) establish a dialogue that allows participants to learn (Stankey and others in press) and ensure their interests are represented early in the process, (2) deliberate on controversial topics so that informed judgments can be made (Yankelovich 1991), and (3) create a consensus about proposed courses of action among those affected by it and those who have veto power over implementation. Consensus (defined as "grudging agreement" at worst) is needed because power to implement is not held by the planning agency but instead is wielded by some group or groups of citizens with special interests. We emphasize that this approach is designed to *create* a consensus rather than to *seek* a consensus. Seeking consensus implies that the planner identifies like-minded citizens who can agree with the planning decision and form the nucleus of support for a consensus to occur. Creating consensus implies that the planner must work together with diverse constituencies and interest groups to develop solutions which, although not necessarily preferred, can be accepted and agreed upon by those who hold and can exercise veto power. Seeking consensus seems to be a technique that imposes, while creating a consensus is one that is derived from interaction. From our perspective, it implies that public involvement processes and techniques will be required to create the atmosphere and opportunity for those with different opinions to carry on a dialogue in a nonthreatening environment so that they can learn from each other and work together to identify mutually agreeable solutions. Arguably, these are the only decisions that will eventually be implemented on the ground.

Value-Laden Nature of Steps in the LAC Process

Many of the decisions made in protected area planning reflect values, norms, and preferences in addition to biophysical data and technical concepts. The LAC process forces explicitness through a variety of *public* decisions made in such steps as identifying important area values and features, setting standards, proposing management actions, and allocating land to different opportunity classes. These decisions are intrinsically subjective and political. Scientists and managers bring to planning particular, and mostly abstract, values and preferences that have no intrinsic advantage over those held by affected publics. To ensure that values and preferences are revealed in the decision-making process, the variety of publics involved in the planning identify and debate these decisions and the beliefs upon which they are founded. The resulting dialogue not only forces explicitness in the process but results in enhanced learning as different participants reveal their own value systems.

Throughout the LAC planning process (and we note any protected area planning process) there are numerous occasions where values play directly in the decision-making process. One decision concerns identification of the purpose and goals of the specific wilderness. A number of questions confront wilderness managers when addressing this question. What unique values or distinctive features and characteristics of the wilderness area should be perpetuated? Does the area contain outstanding ecological, scientific, recreational, educational, historic, or conservation values that warrant special attention? Does the area provide critical

habitat for threatened or endangered species? Do land uses on contiguous areas represent situations requiring special management attention? Are there existing or potential nonconforming uses in the area that will require special attention? How does the wilderness ecosystem and recreation opportunities fit in the regional context of natural resource management? What are the legislative acts, related legal guidelines, and organizational policy that constrain management direction? These questions are important when identifying desired conditions, yet go beyond inventory of features. Statements of desired conditions reflect a particular vision of the future; such choices are inherently value laden and subjective.

Creating a statement of desired future conditions, even in general terms, can be difficult and time-consuming and often reveals both values that are shared and values that are in opposition among and between the interest groups and the agency. For instance, in writing a statement of the desired future conditions for the Frank Church—River of No Return Wilderness, the managers wanted to eliminate all reference to natural fire regimes because they had recently approved a comprehensive fire management plan; they also wanted to eliminate reference to the anadromous fisheries because National Marine Fisheries Service was in control of managing salmon recovery. Both natural fire and salmon population are critical components of the ecosystem. (The tendency to compartmentalize decisions represents a significant institutional barrier—see Stankey, this proceedings.) The public and the citizens LAC working group, on the other hand, were insistent that a statement be included to the effect that both fire and anadromous fish would be returned to their natural role in the Wilderness.

Another step in the LAC process where public values play an essential role is in identifying and prioritizing issues and concerns. A statement of desired conditions and important wilderness values provides the "corral" (USDI National Park Service 1997) for limiting managerial discretion, while issues and concerns identify the barriers to achieving desired conditions. Addressing these barriers is a major task of planning and ensures that it occurs in real time (Friedmann 1993). In addition, understanding the problems is a prerequisite to moving on to solutions. Identification of issues and concerns and developing agreement on them can be conducted only through dialogue and discussion with affected publics and ensures that socially important issues are addressed rather than ones for which data collection is easy. Essentially, such dialogue focuses on "what is broke" to emphasize the need for remedial action. Without agreement on what is broke, agencies find difficulty in gaining the public support needed to allocate resources to the "fixes." In some cases, lack of understanding of issues can lead to outright opposition to plans. Learning-oriented public involvement may also uncover issues and concerns unknown to managers, a particularly important aspect in an era where the funds for management and monitoring are difficult to come by.

Throughout most of the remaining steps in the LAC process there are explicit, yet subjective, decisions where public involvement is not only needed but will also much more likely be accepted and implemented if focused public involvement is utilized. For instance, selecting indicators of resource and social conditions has proven a thorny (or wicked) problem. First, there is little "science" that documents what indicators work well to detect change in physical and social characteristics of wilderness conditions. (For example, there is scant research to tell us what indicator to use to monitor trampling impacts caused by recreation pack stock. Should we measure soil compaction? Increased or decreased surface roughness? Depth of hoof prints? Area covered? Plant damage? Seedling damage?) Likewise, indicators of social conditions are often ambiguous, at best. If the experts (scientists and managers) do not have a clear understanding of what indicators to select, what role can the lay public play in selecting indicators? Our answer lies in the learning of the important concerns and interpretations of wilderness held by members of the public: these help stimulate additional questions and research designed to address socially relevant questions.

Setting of standards (the minimally acceptable biophysical and resource conditions in wilderness) is another important area for public participation. The notion of acceptability implies judgments about trade-offs—in this case, a compromise between maintaining wilderness conditions and amounts of recreational access. Such judgments reflect the relative weight of different values, and can only be implemented in politicized settings following dialogue, learning, and consensus. Through dialogue and mutual learning, people (citizens and planners) will better understand the nature and cause of impacts, the strengths and limitations of various indicators and measurement techniques, and will be much better able to select realistic (or implementable) standards. By more adequately understanding through working through issues, questions, science, and trade-offs, informed public judgment results (Yankelovich 1991).

Both managers and academicians have expressed fears that in such a collaborative, consensus-driven process, people would surely be motivated to perpetuate current conditions and thus would choose the most lenient indicators and standards, effectively allowing the wilderness conditions to degrade to the lowest common denominator. In actual practice, all wilderness LAC plans that used a collaborative planning approach resulted in setting standards that were more stringent than current conditions and required actions that would improve the physical and social conditions in the wilderness. Such processes have also led to more complete implementation of the LAC process (McCoy and others 1995).

We note that there are significant institutional, philosophical, and practical barriers to applying transactive planning to LAC (Stankey and others in press; Stankey, this proceedings). Overcoming these obstacles is neither easy nor fun, and even when well designed, transactive planning may not be completely successful in implementation of plans.

Conclusions

While the Limits of Acceptable Change planning system originally was designed in the tradition of a classical rational-comprehensive planning process, there are powerful reasons for involving the public throughout its implementation. Early public involvement, built upon principles of dialogue and learning, and involving a broad spectrum of

interests, cannot only assist planners in developing more effective plans, but also resolve some issues in a more timely fashion. We note that the theory of transactive planning is an approach to planning different from rational-comprehensive planning with public involvement. In transactive planning, the public essentially conducts the planning and bureaucrats serve to facilitate the planning process through technical knowledge and data analysis techniques.

The LAC process helps structure public involvement by identifying what information is needed when, thus providing the setting for constructive dialogue. Early involvement also sets the stage for development of responsibility for the plan among the affected publics—an important measure of successful natural resource planning (Guthrie 1997). By carefully considering the context of planning, the contributions of the public and scientists, managers can design LAC-based planning processes that will lead to implementation.

References

Ackoff, R. L. 1974. Redesigning the future: a systems approach to societal problems. New York: John Wiley & Sons.

Allen, G. M.; Gould, E. M., Jr. 1986. Complexity, wickedness and public forests. Journal of Forestry. 88(4): 20-23.

Friedmann, J. 1987. Planning in the public domain: from knowledge to action. Princeton, NJ: Princeton University Press.

Friedmann, J. 1973. Retracking America: a theory of transactive planning. Garden City, NJ: Anchor Press/Doubleday.

Friedmann, J. 1993. Toward a non-euclidean mode of planning. Journal of the American Planning Association. 59(4): 482-485.

Guthrie, K. M. 1997. Measures of success in public involvement processes: an investigation of how managers, researchers and members of the public define success. Missoula, MT: University of Montana.

King, J. B. 1993. Learning to solve the right problems: the case of nuclear energy in America. Journal of Business Ethics. 12: 105-116.

McCool, S. F.; Ashor, J. L. 1984. Politics and rivers: creating effective citizen involvement in management decisions. National River Recreation Symposium; 1984 Oct 31–Nov 4; Baton Rouge, LA. Baton Rouge, LA: Louisiana State University: 136-151.

McCoy, L.; Krumpe, E. E.; Allen, S. 1995. Limits of Acceptable Change planning-evaluating implementation by the U.S. Forest Service. International Journal of Wilderness. 1(2): 18-22.

McGarity, T. O. 1990. Public participation in risk regulation. Risk: issues in health and safety. 1(2): 103-130.

McLaughlin, W. J. 1997. The Indian Hills experiment—a case study of transactive planning theory. Fort Collins, CO: Colorado State University.

Stankey, G. H.; McCool, S. F.; Clark, R. N.; Brown, P. J. [In press]. Institutional and organizational challenges to managing natural resources for recreation: a social learning model. Leisure at the Millennium. State College, PA: Venture Press.

Stokes, G. L. 1982. Conservation of the Blackfoot River Corridor — an application of transactive planning theory. Fort Collins, CO: Colorado State University.

Stokes, G. L. 1990. The Evolution of Wilderness Management. Journal of Forestry. 88: (10)15-20.

Thompson, J. D.; Tuden, A. 1987. Strategies, structures and processes of organizational decision. Thompson, J. D.; Hammond, P. B.; Hawkes, R. W.; Junker, B. H.; Tuden, A., eds. Comparative studies in administration. New York: Garland Publishing Company: 197-216.

U.S. Department of the Interior, National Park Service. 1997. The Visitor Experience and Resource Protection (VERP) Framework: a handbook for planners and managers. Denver, CO: Denver Service Center.

Yankelovich, D. 1991. Coming to public judgment: making democracy work in a complex world. Syracuse, NY: Syracuse University Press.

Recreation Management in the Bob Marshall, Great Bear, and Scapegoat Wildernesses: 1987 to 1997

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Abstract—The Bob Marshall Wilderness Complex Recreation Management Direction was approved in April 1987. Monitoring of recreational use has focused on encounters with other parties, the number of campsites impacted, and number of aircraft landings at Schafer Meadows airstrip. The available monitoring information indicates standards are being met for encountering other parties, but that the number of impacted sites, and aircraft landings during some periods, exceeded limits. The primary management tool to reduce recreational use impacts is through encouraging Leave No Trace camping practices. Resolving recreational use allocation and Wilderness resource issues, and improving monitoring information, are important steps in achieving goals and objectives of the Limits of Acceptable Change Plan.

The Bob Marshall Wilderness Complex (BMWC) encompasses 1.6 million acres in the Northern Rocky Mountains of northwestern Montana. The area retains the grandeur, special places, and much of the wildness that was present when the Lewis and Clarke Forest Reserve was established in 1897. Visitors are attracted to the area for the expanses of wild country and scenic vistas. They travel through the area primarily by packstring, backpacking, and rafting.

A committee of agency and public representatives met in 1982 to discuss developing a plan for the Bob Marshall. At that time the framework for the Limits of Acceptable Change (LAC) concept for managing Wilderness was being established. This framework would be followed over the next 5 years until the Bob Marshall, Great Bear, and Scapegoat Wildernesses Recreation Management Direction was approved in April 1987 as amendments to the Flathead, Helena, Lewis and Clark, and Lolo National Forests Land and Resource Management Plans.

Visitation does affect the Wilderness resource, causing some degradation to the area's vegetation, soil, water, fish, and wildlife resources. The level of use can also affect the amount of solitude found and the ability to have a primitive recreation experience in a natural setting. The intent of the BMWC Recreation Management Direction was to answer how much use was too much. The basis for the plan is established in the Wilderness Act and the National Forest Management Act implementing regulations requiring Forest Plans to "provide for limiting and distributing visitor use of specific portions in accord with periodic estimates of the maximum levels of use that allow natural processes to operate freely and that do not impair the values for which wilderness areas were created."

The BMWC Recreation Management Plan answered the question of how much use is too much by describing the kinds of conditions that are permitted to occur in an area, while deemphasizing the defining of appropriate use levels. This LAC approach used in the BMWC Plan recognizes the inevitable impacts that occur as a result of human use. The Plan answers the question of how much use is too much, by answering the question of how much impact or change is too much. The LAC planning system for the Bob Marshall followed the process described by Stankey and others (1985). The last step of the LAC process is to monitor conditions and implement actions. Was the plan successful in helping the stewards of the Bob Marshall maintain the enduring resource of wilderness? The following sections will address this question.

Monitoring Conditions in the BMWC

The primary change in the administration of this area as a result of the LAC planning effort has been a consistent framework and methodology for managers to gather at least the minimum level of monitoring information for visitor encounters, campsite conditions, and aircraft landings at Schafer Meadows airstrip. The Recreation Management Direction prescribes inventory and monitoring requirements and specific minimum resource condition standards as shown below.

Inventories and Monitoring

1. Determine overall use patterns, activities, and levels.
2. Conduct an extensive social survey.
3. Inventory trail conditions.
4. Determine range trend and condition.

Resource Condition Standards

5. Trail, campsite, and river encounters with other parties.
6. Number of human impacted sites.
7. Occurrences of litter on Wild and Scenic River riverbank.
8. Wild and Scenic River recreation user experience quality.
9. Encounters with other float parties at Schafer Meadows.
10. Forage utilization.
11. Aircraft landings at Schafer Meadows airstrip.

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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Accomplishments and compliance with standards are summarized in table 1.

The best available visitor use information indicates that the number of encounters with other parties generally met the minimum standards depicted in the management direction. The number of campsites identified exceeded minimum standards, primarily in the more heavily used Opportunity Class III and IV areas, and at destination sites such as lakes. Aircraft landings at Schafer Meadows exceeded the minimum standard for the number of landings during the Middle Fork of Flathead Wild and Scenic River float season; this predictably occurs mostly in May and June. Specific sites where resource conditions have been a known concern to managers generally had more information gathered about their condition, such as forage utilization, than the minimum requirements reported in table 1.

A specific concern of managers is the limited ability to obtain monitoring data that statistically represents resource and social conditions. Much of the monitoring information collected during this period was obtained without a rigorous statistical sampling design. This limits the managers' ability to use the monitoring samples to reach conclusions about the resource from which the samples have been drawn. As identified in table 1, this has resulted in limited or incomplete resource and social information for many of the monitoring items.

Implementing Management Actions in the BMWC

The Recreation Management Direction developed through the LAC process provided a list of management actions that could be implemented to: (1) reduce human impacted site density, (2) reduce unacceptable site conditions or impacts, (3) improve range conditions, and (4) reduce the number of aircraft landings at Schafer Meadows airstrip.

Wilderness Leave No Trace education programs have been the primary action taken to address issues related to recreational use effects. Another management action being implemented in the Bob Marshall to reduce recreationist site density impacts is campsite restoration through naturalizing sites by removing campfire rings, replacing soil, and revegetating areas as needed. The principal management action taken to minimize unacceptable site impacts was to adopt special orders prohibiting livestock from being tied and grazed within 200 feet of lake shores.

Unresolved Recreation Issues and Changed Conditions

Many recreation related issues identified during the development of the recreation management plan remain unresolved, including determination of the appropriate level of outfitter-provided recreational services; wildlife population goals, objectives, and standards; water quality standards; communications needs and facilities; and administrative site needs.

Problems recognized after the plan was approved, requiring immediate action, included the spread of noxious weeds and the increased importance of securing human foods from grizzly bears. Educational programs and restrictive special orders have been successfully implemented to reduce the severity of these threats to the Wilderness and visitors.

Allowing lightning caused fires to play, as nearly as possible, their natural ecological role in the Wilderness continues to be a priority in the BMWC. The prescribed natural fire program has affected recreational use by changing use patterns and possibly the amount of visitation in some years.

Resolving Issues—An Ongoing Case Study

During the 10 years of implementing the Recreation Management Direction, managers have continued to meet with the LAC work group to display monitoring results, identify issues that need resolution, and gain a common understanding of possible management actions needed to maintain the desired conditions described in the Plan. The BMWC managers are currently assimilating the best available resource and social information to address the level of "outfitter service levels" appropriate for providing for recreational use. This project has developed into an effort to allocate recreational use between the general public and those using the services of various types of outfitting and guiding concessionaires.

Visitor use was estimated at 207,000 recreation visitor-days in 1986 (one recreation visitor-day accounting for 12 hours of visitation). In 1982, approximately 57 percent of all visitors hiked, 36 percent horsebacked, 3 percent hiked with packstock, 3 percent rafted, and 1 percent used another method of travel. Of the visits by horseback, 36 percent were with an outfitter (Lucas 1985).

Table 1—Monitoring accomplishments and compliance with standards.

Accomplishment	Monitoring and condition standard[a]										
	1	2	3	4	5	6	7	8	9	10	11
Monitoring accomplished as planned					X	X	X				X
Incomplete information	X	X	X	X				X	X	X	
Resource standards: mostly attained					X		X				
Resource standards: partially attained											X
Resource standards: not attained						X					

[a]Refer to text for descriptions of the 11 monitoring requirements and resource condition standards.

Managers estimate that there were 191,000 recreation visitor-days of use in the Bob Marshall Wilderness Complex in 1996. Outfitters were allocated 30,000 service-days through the Recreation Management Direction. Of these 30,000 service-days, an average of 18,200 service-days have actually been used over the 3 years, 1994-1996. This level of service-days is equivalent to approximately 33,300 recreation visitor-days. Of the outfitter actual use, 56 percent was associated with fall hunting operations, 44 percent with summer roving pack and float trips, and less than 1 percent with backpacking and nonstock use.

A review of the available monitoring data has revealed that evidence of human use is increasing in some specific areas. Many areas have campsites with standards that are exceeded, and management actions are needed to correct the situation. At the same time, the outfitting industry in the Bob Marshall has requested that managers review the 1980 moratorium on expanding and offering new outfitting and guiding use and services. The recreation use allocation project attempts to resolve resource impact concerns, while addressing the desire to facilitate recreational use by the general and outfitted public.

A close look at the monitoring information for the BMWC as a whole, as well as for specific sites, identifies specific areas of excessive human use. Areas of concern are primarily those within 1 day travel from a trailhead, at destination areas such as the Chinese Wall, at lakes, or along rivers. Evidence of excessive use includes the number and condition of campsites, and site-specific vegetation conditions.

Another concern that was not specifically addressed in the Recreation Management Direction is the condition of the trail system. The concern raised by the public and Wilderness managers is that the total number of useable trails is slowly declining, due to lack of maintenance and impact of stock use during wet periods. Managers anticipate that the trail system is not sustainable with the current level of maintenance.

Concerns Identified in the Allocation Project

The public was involved in the recreational use allocation project through 15 separate meetings. The purpose of the meetings was to establish a common understanding of the management situation in the BMWC, solicit information and opinions, and identify possible solutions. The following issues and concerns were used to build the actions included in the proposed action:

1. Specific areas exist in the BMWC where Wilderness conditions do not meet LAC minimum standards.
2. Only the minimum necessary regulations should be used to manage the Wilderness.
3. The outfitting and guiding industry should have more flexibility in providing for recreational use opportunities.
4. Historical patterns and methods of outfitter and guide use should be maintained.
5. Areas within 1 day travel from popular trailheads need to be managed to reduce crowding and resource problems.
6. Increase the number of campsites suitable for a 14 day stay with pack and saddle stock that are not occupied by an outfitter fall base camp.
7. Some additional fall outfitting base camp locations need to be available if a prescribed natural fire or wildfire requires a camp to be moved for safety reasons.

Proposed Management Actions

Based on the issues and management concerns identified, the following management actions are proposed. These actions are intended to move the Wilderness closer to desired Wilderness conditions and to promote compliance with the Recreation Management Direction minimum condition standards.

Considerations for Wilderness Conditions

1. Retain the indicators and standards for Wilderness conditions described in the Recreation Management Direction.
2. Establish new LAC indicators and standards for winter use.

Considerations for Recreation Management

1. Install temporary stock hitchrails or highlines for the general public at selected bottleneck locations.
2. Limit group size to the current level of 15 people, and reduce livestock numbers from the current 35 animals per group.
3. Require firepans or fire blankets for all open fires.
4. Restrict pack and saddle stock grazing before September in areas of known excessive forage use.
5. Limit livestock use to current levels for outfitters, and possibly for all recreational-use activities, unless it is projected that additional use will not degrade trail, site, and vegetation conditions.
6. Eliminate some outfitter fall hunting base camps in congested and easily accessible areas.
7. Inventory outfitter developed access trails and evaluate their effects on Wilderness conditions.
8. Issue institutional outfitter permits on a limited basis if it is determined that the use would not degrade trail, site, and vegetation conditions.
9. Continue to emphasize Leave No Trace Wilderness education programs.

Alternatives will be developed through additional public involvement based on variations of the above actions that reflect the Recreation Management Direction as well as allocation issues and concerns. An Environmental Assessment will be completed that discloses the impacts of the proposed action and alternatives, and the public will continue to be involved until the BMWC managers decide on the best course of action to implement.

Conclusions

The Recreation Management Direction for the BMWC provided the basic framework and public involvement approach to guide the management of the BMWC stewardship programs. The emphasis on describing the kinds of conditions that are permitted to occur in the area, while avoiding rigid regulatory use limits, are fundamental strengths of the LAC planning process.

The Recreation Management Direction recognized the need for improved inventories and monitoring. A sound monitoring program is an essential component of the LAC process allowing managers to implement adaptive management actions to assure that Wilderness conditions are preserved. A lack of basic inventory and monitoring information for many resource elements may hamper the ability of managers to make decisions based on actual resource conditions, and could result in a failure to resolve critical resource problems. The ongoing recreation use allocation project is a significant test as to whether the BMWC LAC Plan has made and will make a difference.

References

Lucas, Robert C. 1985. Visitor characteristics, attitudes, and use patterns in the Bob Marshall Wilderness Complex, 1970-82. Res. Pap. INT-345. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 32 p.

Stankey, George H.; Cole, David N.; Lucas, Robert C.; Petersen, Margaret E.; Frissell, Sidney S. 1985. The limits of Acceptable Change (LAC) system for wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Limits of Acceptable Change Planning in the Selway-Bitterroot Wilderness: 1985 to 1997

Dan Ritter

Abstract—In 1985 the Forest Supervisors and staff of the Bitterroot, Clearwater, and Nez Perce National Forests met and agreed to an action plan for implementing a Limits of Acceptable Change (LAC) planning process for the Selway-Bitterroot Wilderness (SBW). The process, which was to include a citizens task force, was to produce a completed management plan in 2 years. Eight years later, in May 1992, the Selway-Bitterroot Wilderness General Management Direction was officially amended to the Forests' forest plans and the implementation phase began. This paper documents the application of the LAC process in the Selway-Bitterroot Wilderness. It assesses the effect of LAC on both the current management of the Wilderness and the condition of the resources within the area.

History of the LAC Process in the Selway-Bitterroot Wilderness

Between spring 1985 and spring 1992, a group of Forest Service managers representing three National Forests and six Ranger Districts, along with a group of 20 to 30 citizens, met over 40 times to write a management plan for the Selway-Bitterroot Wilderness using the LAC process. The effort culminated in 1992 with a management plan for the Wilderness that addressed recreation, trails, and airfield issues (table 1). Additional issues were to be resolved in smaller groups of citizens and managers over the next 2 years. In the spring 1994, concerns by decisionmakers about the Federal Advisory Committee Act and the ties between LAC and the forest plan revision process, led to a decision to temporarily end the planning process for the Selway-Bitterroot Wilderness. Several issues were left unresolved and, as of 1997, the planning process has not resumed.

Citizen's Task Force

The SBW Citizen's Task Force, assembled in November 1987, was composed of researchers, scientists, interested citizens, and resource managers. The membership varied between 20 and 30 people throughout the 8 year planning effort. The Task Force approached all the issues hoping to reach a consensus agreement that would be forwarded to Forest Service decisionmakers. The full Task Force tackled the recreation and trails issues. Later in the process, issues were assigned to smaller groups that met separately and reported their progress at monthly meetings of the full Task Force.

Throughout the process, new members joined the Task Force and old members dropped out. A considerable amount of time was spent educating new participants and briefing them about the group's progress. These changes in membership were inevitable, but more could have been done to bring the newcomers up to speed outside of the regular Task Force meetings. Although members of the Task Force were carefully selected by the Forest Service to reflect all stakeholders, communication between the representative sitting on the Task Force and his or her constituents was often inadequate. Several members of the Task Force did not have the necessary communication skills or trust with their constituents to convince them that the deliberations represented the groups concerns.

In 1994, concerns over the Federal Advisory Committee Act led to a decision to move toward a more open public meeting format. The close relationship between members of the Task Force and the Forest Service decisionmakers ended. Although many members of the original Task Force stayed with the process, some of them dropped out with a feeling that their help was no longer wanted. For a few years after this decision, public meetings were well attended, but the special bond between citizens and agency had eroded.

Effect of LAC Management Plan on Current Management

Inventory and Monitoring

As was the case with many wildernesses that applied the LAC process, the Selway-Bitterroot Wilderness had little information about wilderness conditions when planning began. The Task Force made many of its recommendations based on an incomplete understanding of the existing situation. The primary basis for allocating opportunity classes came from existing condition maps drawn from limited field data. Since the plan was written, more field information has been collected. This has been a change for the better. However, some of the new data calls into question some of the assumptions that formed the basis for allocating opportunity classes and for defining standards. There has been a general reluctance to consider changing any of the allocations or standards based on this new information. Despite the fact that the LAC process is a dynamic one, based on feedback from monitoring, it has been difficult to get members of the public and managers to consider modifying the plan.

The indicators designed to monitor resource and social conditions in the Selway-Bitterroot Wilderness were

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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Table 1—Selway-Bitterroot Wilderness LAC Timetable.

Spring 1985	Forest Supervisors and staff agree on an action plan to develop an LAC-based management plan for the Selway-Bitterroot Wilderness.
Summer 1986	Collection of campsite inventory data.
Fall 1987	Issues identification (Step 1). First meeting of the LAC citizens task force.
Spring 1988	Opportunity Classes defined (Step 2). Indicators selected (Step 3).
Spring 1989	Standards defined (Step 5).
Fall 1989 to spring 1991	Management actions identified (Step 7). Monitoring elements defined (Step 9).
Spring 1992	SBW General Management Direction amended to forest plans. Focused on trails, recreation, and airfields.
Fall 1992 to spring 1994	Work continued on unfinished wildlife and vegetation planning.
Spring 1994	Decision made to "pause" the SBW planning effort. Citizens task force disbanded.

modeled after the standards written for the LAC management plan in the Bob Marshall Wilderness (table 2). Other than the Bob Marshall example, there was limited research and practical experience that could be used to develop unique indicators for the SBW. For this reason, and perhaps because it is easier to adopt what others have done than to invent something new, campsite conditions and encounters with other groups were the indicators selected for the SBW.

Monitoring encounters with other groups and at campsites has proven difficult. Standards are expressed in terms of a probability that a visitor will experience a set of social conditions while in the wilderness—"there is an 80% chance of encountering no more than X parties per day." Hidden in this relatively simple standard are a host of complex monitoring protocol decisions that had to be made before meaningful data could be collected. It took managers 3 years of trial and error before a set of monitoring protocols were in place that were responsive to the standard and had some level of reliability. Once reliable field monitoring protocols were in place, and wilderness rangers started gathering the data, managers ran into further difficulties designing a storage and retrieval system so the data were usable for decisionmaking.

Many questions have been raised during implementation of the Selway-Bitterroot Wilderness plan relating to the usefulness of campsite conditions and encounters as key indicators. Are they responsive to the unique goals and objectives for the area? How do encounters experienced by wilderness rangers in the course of their job duties relate to the user's experience? Are there better indicators that would measure those attributes that make the SBW unique in a regional and national context?

Management Methods List

The Selway-Bitterroot Wilderness management plan uses a list of "possible management methods" to serve as a menu of possible actions for managers to select from if existing conditions violate LAC standards. They are listed in order of management preference. The light-handed actions (such as education, discouraging users through signing, and so on) are "most preferable," while the heavier-handed actions (such as closures, permit systems, and so on) are considered "least preferable but still acceptable." The management plan elaborates further on the use of these management methods, stating, "In general, methods assigned as least preferable should not be used unless other light-handed methods have been tried unsuccessfully."

This list poses many dilemmas for managers. As Cole (1995) points out, the assumption that direct controls have a negative effect on visitor experience or that indirect controls are less obtrusive to the visitor is not universally supported by research findings. In fact, Cole argues that visitor freedom may be enhanced by applying a direct control as opposed to placing restrictions on where visitors can go and what they can do when they get there. There is also the question of effectiveness. By the time managers have exhausted the indirect controls and must resort to more direct actions, the resource may have been severely impacted.

In the Seven Lakes area of the Selway-Bitterroot Wilderness, managers have attempted to avoid limiting use in their efforts to reduce the number of campsites and improve the condition of the sites. They have selected a number of less

Table 2—Standards for site and social indicators in the Selway-Bitterroot Wilderness.

Indicator	Opportunity Class 1	2	3	4
Maximum number of sites per square mile				
Light impact	1	1	2	1
Moderate impact	0	1	1	2
Heavy or extreme impact	0	0	0	1
Maximum number of sites per square mile	1	2	0	4
Maximum number of other parties encountered per day, 80 percent of the time	0	0	2	5
Maximum number of other parties camped within sight or sound, 80 percent of the time	0	0	1	2

heavy-handed actions from the management methods list. Visitors are restricted in their choice of camping location, stock tying location, and group size. Signs are posted at the trailhead and along the trails leading into the lake basin. Other lake basins within the Wilderness have degraded conditions similar to the ones found at Seven Lakes. Managers feel compelled (because of the language in the management plan) to approach the problem with indirect techniques without even considering what may be a more effective and perhaps less obtrusive direct control.

The intent of the "possible management methods" list was to serve as a menu of options from which managers could choose. This list may have become a crutch for both the public and managers during the planning process. Users may have assumed that relatively benign indirect techniques would be sufficient to deal with most violations of standards. They chose quite stringent impact standards with little apparent recognition of how their access and wilderness experience might be affected by the actions needed to achieve these conditions. More serious consideration of direct controls during the planning process might have helped participants understand the potential consequences of the standards they set for the Selway-Bitterroot Wilderness.

Prevention of Significant Deterioration

The Selway-Bitterroot Wilderness management plan includes a goal that is commonly referred to as the Prevention of Significant Deterioration, or PSD. The defined intent of this goal is to "prevent a net degradation of the wilderness resource...." This goal could contradict the idea of setting "standards" in the LAC process where conditions can be allowed to deteriorate further, until a minimally acceptable condition is reached. One way for the two concepts, PSD and LAC, to work together would be to set standards that reflect current conditions. This may have been the intent of the Task Force when they adopted the PSD language, because the management plan generally reflects an intent to preserve existing conditions. Alternatively, the two concepts could work together by making certain that places where conditions were allowed to deteriorate (by writing standards less stringent than current conditions) were offset by places where they were to be improved (by writing more stringent standards). This scenario is already taking place. Some areas are improving while others have deteriorated somewhat. Including both PSD and LAC standards remains a point of confusion for both managers and the public.

Opportunity Classes

The Selway-Bitterroot Wilderness management plan defined four Opportunity Classes in terms of their resource, social, and managerial setting. Opportunity Class 1 is the most pristine and unmodified and represents almost 98 percent of the area. Opportunity Class 4 has a relatively higher amount of use and associated impacts. It represents less than 1 percent of the area. Opportunity Classes 3 and 4 are described in gradations between Opportunity Classes 1 and 4. Most of the system trails and popular camping locations are in Opportunity Class 3.

The opportunity class descriptions serve to prescribe, in general terms, a desired future condition for the Wilderness. The opportunity class definitions do not address the unique attributes of the Selway-Bitterroot Wilderness in the context of other wildernesses in the region or compared to the National Wilderness Preservation System as a whole. One can piece together a management vision of the Selway-Bitterroot Wilderness by examining how the opportunity classes were allocated on the ground and the standards that were assigned to each opportunity class. What emerges is a management plan that generally reflects the existing condition, both in terms of use levels (social) and campsite conditions (resource), at the time the planning process was under way (1985 to 1992).

Exceeding Standards—Yellow Light or Red Light?

The Selway-Bitterroot Wilderness management plan does not specifically address the question of whether violating a standard requires immediate action or further study. Disagreement exists among managers. Without clear policy in the management plan, different philosophies have emerged about what to do with the more than 120 areas in the Wilderness that exceed one or more standards. Some districts aggressively manage sites that violate standards while other districts do not.

Barriers to Implementation

Disagreements Among Managers

Acceptance of the LAC plan by managers of the Selway-Bitterroot Wilderness has been inconsistent. Many of the managers that were involved in the LAC planning process are strong supporters of the plan and its implementation. Other managers feel that the LAC planning process was flawed. This group's reluctance to accept the conclusions of the planning process (the SBW management plan) has made consistent implementation difficult. The number of administrative units involved in the management of the Wilderness and their physical isolation from each other exacerbates this problem. In 1992, a coordinator position was created whose primary responsibility was to ensure consistent implementation of the LAC plan across the six ranger districts and four National Forests that manage the Selway-Bitterroot Wilderness. District and Forest staff were organized into coordination teams, each with a specific role ranging from policy making to field monitoring. The coordination structure evolved as budgets and personnel changed, but the challenge remained the same: consistent management of the Wilderness according to the LAC management plan.

Effects Disclosure

When the LAC plan was amended to the forest plans in 1992, a procedural exclusion was used to eliminate the requirement of the National Environmental Policy Act (NEPA) to disclose the potential effects that may result from

the plan's implementation. The use of this exclusion meant that an Environmental Assessment (EA) or Environmental Impact Statement (EIS) was not needed. It is in an EA or EIS where decisionmakers and the public can read about the various management strategies (alternatives) and the consequences and trade-offs of each of those strategies. Because there was only one management strategy for the Selway-Bitterroot Wilderness (the one that emerged from the consensus-based LAC process), decisionmakers and the public could not contrast various ways to manage the area and the trade-offs of each. Consequently, there is no official record documenting the decisions made during the LAC process and the deliberations of the Citizen's Task Force. When managers and citizens who were originally involved in the LAC planning effort leave, there will be no official documentation of the planning process for new managers to rely on to support their decisions. The decision to not write an EA or EIS was a significant procedural flaw in the planning process because it did not provide the legal underpinnings that will be necessary to support future management decisions.

Implementation of the Plan

"What do we do now?" is an often-repeated phrase at SBW coordination meetings. Over 120 sites do not meet the standards set by the LAC process, but there is little direction and few criteria to help managers prioritize which sites to tackle first. The mechanics of the LAC planning process were well thought out, but managers did not spend enough time thinking about implementation of the plan. The potential effects on the Wilderness users from the management actions that will be necessary to comply with LAC standards were hardly discussed. This was primarily because the consequences of the "most preferable" education management action were relatively benign to users. If wilderness conditions were not meeting the standards, managers would simply apply an education strategy to the problem. Focusing more on implementation may have led to more attainable standards or would have at least provided users with realistic expectations about the consequences of meeting the standards.

A Wilderness Implementation Schedule (WIS) was developed in 1993 that outlined the cost of fully implementing the LAC plan in the Selway-Bitterroot Wilderness over a 5 year period. The WIS provided a good overview of costs, but it did not establish priorities or help focus work on the ground. For that reason the Selway-Bitterroot Wilderness WIS was not widely used in project planning.

Public Involvement

The Federal Advisory Committee Act (FACA) became an issue in 1994. The Forest Service had just become aware of the law, and local decisionmakers were uncomfortable with the way citizens were involved in the Selway-Bitterroot Wilderness planning process. Shortly after the management plan was completed, the Citizen's Task Force was disbanded in favor of a more open public meeting format. Many longtime members of the Task Force became disillusioned with the Forest Service and dropped out of the planning process. The close working relationship that had developed between the agency and a group of citizens was damaged. Managers lost the close contact with a group of citizens that were advocates for the agency—a group that could have been allies during implementation of the LAC plan. Another reason the citizen's group was disbanded was because members of the group wanted to be involved in project-level decisions. Some decisionmakers felt that including citizens in implementation decisions was inappropriate.

Lessons Learned and a Look to the Future

The primary benefit of the LAC planning process has been the incorporation of goals, objectives, and monitoring elements for the Selway-Bitterroot Wilderness into forest plans. In theory, and often in practice, management projects and decisions are linked directly to the goals and objectives developed from the LAC process and now incorporated into the forest plan.

The goals and objectives described in the SBW management plan are not perfect. They describe an area that is fairly generic among wildernesses in the Northern Rockies. The plan does not articulate the features (experiences and resource conditions) that make the Selway-Bitterroot Wilderness unique and worth preserving. During the next round of forest planning it will be important to take the LAC plan a step further by describing in more detail what role the Wilderness plays in the region and nation. When those unique attributes of the Selway-Bitterroot Wilderness are described, managers may realize that the current plan is based on the wrong indicators or that additional indicators are needed. For instance, one could describe the Selway-Bitterroot Wilderness as unique because of the opportunity for fires to burn unrestricted by humans. If unrestricted fire is a process that warrants protection, managers will need to design monitoring protocols for indicators that differ from the current ones focused on campsites and visitor encounters.

The bond that occurred between users, citizens, and agency people during the LAC process was significant. After years of face-to-face discussions about perplexing and complex issues, a group of people with varied backgrounds and values agreed on the best way to manage the Selway-Bitterroot Wilderness. The LAC process provided the framework that brought people together to share their experiences and knowledge. The process produced a planning document, but it also helped people with varied positions on the issues understand that there were no easy answers. The compromises that created the management plan required that each member of the Citizen's Task Force understand the issues and empathize with the views of their fellow citizens. The group became not only experts in forest planning, but they became stronger wilderness supporters and agency champions. This kind of relationship could only have been built through dialogue and by taking the time that the LAC process requires.

Reference

Cole, David N. 1995. Wilderness management principles: science, logical thinking or personal opinion? Trends. 32(1): 6-9.

Visitor Experience and Resource Protection Framework in the National Park System: Rationale, Current Status, and Future Direction

Marilyn Hof
David W. Lime

Abstract—The Visitor Experience and Resource Protection (VERP) framework was developed by the National Park Service to address carrying capacity questions associated with visitation-related resource impacts and impacts to the quality of visitor experiences. The framework can be applied as part of a park's general management planning process (general management plans, GMPs), to address visitor use issues for parks with existing GMPs, or to address issues in specific areas within a park. This paper explores similarities and differences between VERP and other planning frameworks as well as assesses the National Park Service's experience in applying VERP. Conceptual issues and changes that may be needed to make VERP more useful also are discussed.

The National Park Service has been required by law since 1978 to address carrying capacity in units of the system. The General Authorities Act of 1978 (U.S. Public Law 95-625) specified the requirement for all park units to have a general management plan (GMP), and prescribed several required elements that must be contained in such plans. Among these requirements is the "identification of implementation commitments for visitor carrying capacities for all areas of the unit" (U.S. Public Law 95-625). Additional National Park Service policies also state that GMPs will address carrying capacity.

Until recently, GMPs addressed carrying capacity in one of two ways—if, indeed, they addressed it at all. One approach was simply to establish a facility capacity based on the sizes of existing parking areas, visitor centers, campgrounds, and other developments. A second approach was to predict, based on visitation projections, the point in time or visitation level at which facilities would be considered "full" or "crowded." The GMP would call for "visitor use studies" at some future time to define specifically what is meant by full or crowded. Regardless of the approach, there was an absence of a process or framework to address visitor use management issues and impacts systematically. Both within and outside the agency, there was criticism of the National Park Service's ability to meet its legislative mandate.

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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As visitation to units of the National Park System has continued to rise, agency and public concerns have increased with respect to congestion, crowding, other impacts to the quality of visitor experiences, visitation-related resource impacts, and reductions in the diversity of experience opportunities in parks (Lime and others 1995; Lime 1996; Mitchell 1995; Wilkinson 1995). The traditional management response of increasing the size of the infrastructure (building more and bigger parking areas, campgrounds, visitor centers, roads, and trails) to accommodate more and more people is no longer an adequate solution. Deteriorating facilities and declining construction and maintenance budgets are making this response unrealistic. More important, many park managers, as well as many segments of the public, are challenging the appropriateness of "sacrificing" more park lands to pavement and other facilities.

By the early 1990's, the lack of planning and management processes to address visitor use and visitor use impacts was becoming a critical issue in many parks. The Washington directorate charged the Denver Service Center (a primary facility for the National Park Service's planning, design, and construction activities) to develop and test processes that would allow parks to deal with visitor use issues. Two major caveats were specified: (1) any processes developed would have to be incorporated into existing planning and management frameworks, and (2) the processes had to ensure that decisions would be trackable and justifiable.

VERP and Planning

The National Park Service response to developing a carrying capacity framework is VERP—Visitor Experience and Resource Protection (USDI National Park Service 1993). Since 1992, an interdisciplinary team of National Park Service employees and researchers have been working to develop and test a process that is responsive to National Park Service needs and is conceptually grounded in the scientific literature.

Nine elements are included in the VERP framework (appendix A). While the scope of the elements, the order in which they are undertaken, and the specific methods used to complete elements may vary in different situations, all of the elements are necessary to implement a VERP program. Although the elements are numbered and may appear to follow a linear process, it is important to remember that the VERP framework is iterative, with feedback and feed-forward occurring throughout the elements.

The VERP framework was primarily conceived and designed to be part of the park GMP process. Indeed, many elements in the VERP framework are incorporated into each park's GMP. However, there are other situations where VERP may be applied outside the GMP process. For example, it may be necessary at times to address visitor use issues for parks with existing GMPs or to address visitor use issues in only one or two areas within a park. A separate visitor management plan or an amendment to an existing plan may be appropriate in these cases.

Before looking in more detail at the process differences between VERP and the Limits of Acceptable Change (LAC) process (Stankey and others 1985), it might be helpful to explain how the future of VERP is seen within the National Park Service at this time. Developing VERP has taught us a great deal about how to do better planning. Many of these new insights are being incorporated into a new National Park Service planning guideline and handbook that currently are under development. Identifying desired future conditions by individual management zones and assessing alternative allocations of those zones will be integral to the new GMP in the National Park Service.

The term VERP, as part of the GMP, will be lost in future plans. According to current National Park Service guidance, GMPs will qualitatively address carrying capacity by describing visitor experiences and resource conditions by zone. Most future GMPs, therefore, will not contain further carrying capacity details. In most cases the more quantitative elements of the VERP framework—specifying indicators and standards, developing a monitoring strategy, and identifying management actions to address conditions when standards are reached or exceeded—will be accomplished in an implementation plan that will follow a GMP.

The prototype GMPs currently in progress (Mt. Rainier and Isle Royale National Parks, the St. Croix National Scenic Riverway, and the Flagstaff Group, which includes Wupatki, Walnut Canyon, and Sunset Crater Volcano National Monuments) will include the VERP implementation steps, but this probably will not be the pattern in the future. Under this scenario or way of thinking, if VERP retains a process identity over time, it will be associated with an independent, implementation level of visitor use planning and management.

Comparing VERP and LAC

Conceptually, VERP does not differ from LAC or other planning frameworks (such as Visitor Impact Management, VIM (Graefe and others 1990); Carrying Capacity Assessment Process, C-CAP (Shelby and Heberlein 1986); Quality Upgrading and Learning, QUAL (Chilman and others 1990); Visitor Activity Management Process, VAMP (Environment Canada and Park Service 1991). All propose to address questions of carrying capacity, appropriate visitor use, and biophysical impacts caused by recreation use. While each framework calls for its own steps and general procedures, they all address both environmental and experiential (social) conditions. In one way or another they call for the formulation of management direction for the future (such as desired future conditions, objectives, goals) and specify such direction through indicators and standards of quality. Monitoring is required to assess when minimally acceptable conditions (carrying capacity) has been reached or exceeded. And management strategies, tactics, and actions are identified to deal with situations when conditions are no longer acceptable.

Defining desired future conditions, identifying indicators of quality, setting standards, monitoring, and taking appropriate management actions fit well with National Park Service planning and management frameworks, including VERP. A few process changes were needed, however, to address the diversity of frontcountry situations in the National Park system and to integrate fully the LAC-type approach into the National Park Service planning process. The VERP process, because it is part of the GMP process, includes some initial steps to establish a planning foundation based on park purpose and significance; VERP alternatives are the same as GMP alternatives, and so are broad and conceptual and contain elements unrelated to visitor use management; management zones are described somewhat differently from Recreation Opportunity Spectrum classes; and the definition of steps and their order is changed from LAC.

LAC begins with identification of issues and concerns (step 1), and then later in step 6, alternatives are developed to respond to those issues. In National Park Service planning, a conceptual shift is made from "issue driven" planning to "goal-driven" planning. This is a subtle difference, but one the National Park Service is finding to be important. Goal-driven planning is based on a philosophy that issues are nothing more than the obstacles that lie between existing conditions and future desired conditions. This implies that you must know what your desired state is (goals) before you can really understand issues. Certainly, issues are identified at the beginning of a planning process, but a great deal of time and energy is spent establishing future goals—beginning with affirmation and articulation of the purpose and significance of the park. All subsequent planning alternatives and eventual decisions are bounded by the park's purpose and significance. Alternatives are developed that describe different futures (presented largely, but not entirely as different allocations of management zones), based on different conceptual frameworks. The obstacles that must be overcome (issues that must be solved) to implement different alternatives may differ with each alternative, even though, admittedly, many fundamental issues will be common to all alternatives.

Because VERP is integral to the GMP, the alternatives developed include desired future conditions at both parkwide and zone levels. Management zoning is explored for the entire park, and zones include appropriate types and levels of development (including park administrative facilities and concession services), appropriate management tactics and actions, visitor experience opportunities, and biophysical and cultural resource conditions. Some alternatives may include parkwide goals, such as desired outcomes of fire management or wildlife protection, or general intent of interpretation programs.

While zone descriptions help identify indicators and standards of quality in a relatively broad sense and are based on qualitative judgments, specific indicators and standards for monitoring are not finalized until the implementation phase of VERP planning. At that time more quantitative and in-depth studies can probe for specific indicators and set

associated standards. This approach seems to make sense because, while indicators and standards are tied to zones and so would generally be consistent throughout alternatives, the eventual preferred alternative may not incorporate all potential zones. Particularly with the difficulties in selecting indicators and standards of quality in high use, frontcountry settings, and the research needed to increase our understanding of these issues, National Park Service planning leadership is hesitant to include this level of detail (not to mention costs) in the GMPs. A potential problem with this approach is asking the public to buy into a conceptual plan without being able to evaluate fully the tradeoffs involved in managing for particular standards. This makes public involvement critical during VERP implementation planning.

During early discussions concerning park zoning and the need to differentiate among experience opportunity types, the Recreation Opportunity Spectrum (ROS) was investigated as a promising tool. It was decided that the range of opportunity classes and traditional definitions specified for ROS were not diverse enough to accommodate application to the diversity of experience opportunities that National Park System areas need to offer. Conceptionally there is little difference in LAC and VERP zones, but it was decided that each park unit probably will need to describe a unique set of zones. Some zones may transfer from park to park, but experience so far indicates that this will not be the norm. Some experience opportunities are similar from park to park, but each park seems to need to tailor the zone description to its particular situation, resource limitations, and visitor characteristics.

VERP Works, But Questions Remain

Has the VERP process been a success for the National Park Service? We offer a qualified, "We think so, but time will tell!" The fact of the matter is that the VERP process has been applied at very few places (fewer than five), and an implementation plan has been completed only at Arches National Park in southeastern Utah (USDI National Park Service 1995). The VERP effort began in early 1992 (USDI National Park Service 1993), and the Arches test did not begin until later that year (Manning and others 1996a,b). Only now is the staff at Arches beginning a monitoring program in earnest. Therefore, it is far too early to be reporting on definitive successes or failures associated with this process. Nevertheless, we offer the following observations about this process and some challenges that we think lie ahead.

We feel confident the elements of the VERP framework are offering parks improved tools to enhance visitor opportunities and resource protection, as well as to improve overall National Park Service planning. Interest in the VERP process has come from throughout the organization. Those associated with the effort, both within and outside the agency, are frequently asked to explain the process and report on its application at Arches National Park and elsewhere. A brochure concerning VERP was recently published to inform proponents and skeptics alike about what VERP is and what it can and cannot do for National Park Service planners and managers (USDI National Park Service 1997).

The new emphasis on prescriptive management zoning is particularly attractive to planners and managers. The zone prescriptions give managers guidance to make informed and defensible decisions for different areas of their parks without dictating specific actions that must be taken. This allows managers increased flexibility and control, and may lengthen the useful life of GMPs.

Application of the VERP-LAC-type process to recreation issues in frontcountry does not seem to have been an obstacle. The principles and tasks of specifying park purpose and significance, management zones, indicators and standards of quality, monitoring, and taking appropriate management action when standards are approached or exceeded seem to be as "comfortable" in frontcountry, high-density-use settings as in designated, low-density-use wilderness. The 1995 Arches National Park implementation plan (USDI National Park Service 1995), for example, included a variety of indicators and standards as well as guidance for monitoring both biophysical and experiential conditions. The plan included direction for frontcountry, backcountry, and several other types of relatively homogeneous settings—nine management zones were delineated.

Our experience with both VERP and LAC leads us to conclude that the conceptual issues associated with these frameworks and changes that may be needed to make them more useable and defensible are more similar than different. One area of concern has to do with creating an institutional setting in which **all levels** of the management system are **committed to** and **held accountable for** implementation of the process. Implementing such frameworks can be complicated and costly for agencies and institutions. Implementation requires substantial investments in employee training as well as in data collection to specify indicators and standards, and to develop long-term monitoring activities (Lime 1995; Lime and Lewis 1996). If a particular management area does not have the commitment and resources to monitor indicators and to take action when conditions are out of standard, then why do a VERP or LAC implementation plan or use the framework in the first place? Agencies using these planning and management tools should consider incorporating pertinent elements of the process in the annual performance standards of affected employees.

The recent National Park Service decision to deal with indicators, standards, monitoring, and management outside the GMP, raises important questions about the agency's commitment and ability to address these most significant elements of this planning framework. Without a rigid institutional process and requirement (teeth) for implementation, many managers may view completion of these activities as voluntary or optional. It is feared some managers could use this flexibility as administrative discretion to postpone action, perhaps indefinitely.

The institutional setting is not the only possible constraint to implementation of these important elements. Suitable funding is another issue. No funding sources or mechanisms currently exist for VERP implementation planning. This should be interpreted not so much as a lack of interest or belief in the need for VERP, but rather as a function of the overriding need to spread limited GMP dollars as far as possible. It should be noted, for example, that fewer than half the National Park Service's 374 units have up-to-date or approved GMPs. Current thinking of the planning leadership is stressing that GMPs be long-term,

broad, and conceptual and should not include implementation planning of any kind.

Monitoring is an integral part of these and related frameworks—they are **not** add-on's. Often, we fear, monitoring of selected indicators of quality is seen as some sort of extracurricular activity that is separate from the overall process. And as we learned during the Arches test, monitoring activities need to be thoughtfully considered **during** the formulation of indicator variables and their associated standards, not **after** they are agreed upon. That is, monitoring is much dependent on the way in which indicators and standards are defined and expressed. As such monitoring cannot occur unless there is a clear understanding of what needs to be measured and in what context (Lime and Lewis 1996).

Our experience in implementing VERP at Arches National Park and elsewhere reconfirms the lack of understanding or agreement about what is a standard. From our perspective, standards are minimally acceptable conditions or thresholds of acceptability for indicator variables. That is, if a particular standard is not violated, the condition is considered to be within an acceptable limit. When the standard is violated, the condition is deemed unacceptable and management should initiate action to bring the condition back within the acceptable limit. Standards should not be viewed as management goals, targets, or desired future conditions.

Agency administrators, researchers, and others will continue to grapple with the question of how much research is necessary to identify indicators of quality and to specify standards. The costs, in time and funding, to conduct biophysical, cultural, and social research are significant, and there are legitimate concerns about the ability of park units, especially small ones, to participate in such activities. In lieu of conducting more research to define appropriate indicators and standards, perhaps there is an opportunity for the research community to collaborate with practitioners in an effort to specify a set of key indicators that are relatively constant across all types of park units—or determine if there are groups of key indicators that are fairly constant among certain types or categories of units (Manning and Lime 1996). This exercise also might identify a key set of standards for which a range of realistic parameters could be specified. The intent would not be to establish a "cookbook" approach to identifying indicators and standards of quality that users would go to for the solution to their problem, but rather a collection of experienced-based findings illustrative of the general target for a particular situation. It would be recognized that more appropriate or better indicators and standards could evolve through more research and field experience.

In lieu of conducting research about indicators and standards at sites where there is interest in using VERP or other frameworks, perhaps an expert panel of individuals could visit a site to offer their informed and collective ideas. We envision an interdisciplinary team that would spend 3 to 4 days at a location exploring park purpose and significance, existing resources (biophysical, cultural, and social) and resource conditions, and so forth. They would conclude their visit with an interactive meeting with park staff and a set of written recommendations concerning what might be appropriate indicators and standards of quality for the site, ideas about a monitoring plan to track potential change over time, and suggestions about management tactics and actions to address impacts that are found to be reaching or exceeding acceptable standards. Results of the exercise would be useful in further staff planning activities and for public involvement. In this approach we risk being too "expert-driven" unless some work with the public could occur ahead of time to identify potential indicators and ranges of acceptable conditions. Of course, the public also should have an opportunity to comment on and refine the standards identified. Such "design teams" have been used successfully in Minnesota to explore community development and rehabilitation questions in urban areas for more than a decade.

Ideas for additional research to enhance LAC-type programs have been discussed in many meetings and publications (see Shelby and others 1992), and there is no lack of suggestions. Research is needed to address both biophysical and social science questions concerning visitor use management and carrying capacity. A workshop to identify research needs specifically associated with VERP, and more generally with congestion and crowding in the National Park system, was held in Minnesota in 1993 (Lime 1996). Many information needs and research questions were offered on a variety of topics, primarily related to the role of social science (appendix B). The topics addressed three interrelated research themes: (1) refining the VERP framework and its application to a variety of park and recreation settings, (2) enhancing the capabilities of direct management of visitor behavior to alleviate unacceptable impacts, and (3) enhancing the capabilities of communication (information, education, interpretation, and persuasion) and other indirect management to address congestion, crowding, and other impacts.

Conclusions

The VERP framework is more similar than different when compared to other planning frameworks. What changes have been implemented for the VERP process have been driven by the need to fit with various National Park Service planning and management guidelines and procedures. While the VERP framework generally seems to be working successfully for the National Park Service so far, there are too few applications and experience within the agency to embrace the process as a model for the future. Furthermore, the VERP experience in the National Park Service seems to have uncovered many of the same obstacles and concerns as have other planning frameworks such as LAC, VIM, and VAMP.

VERP, along with other planning frameworks, is no panacea for dealing with growing visitation and potentially unacceptable impacts to biophysical resources and visitor experiences. We think the most challenging aspect of applying VERP and other frameworks will be to create an institutional or agency commitment to carry out and sustain effectively all the important elements required. We are concerned the recent National Park Service decision to address indicators, standards, and monitoring outside the GMP will continue to raise many questions about this agency's ability to implement and commit to the process. Without a mechanism that would ensure that all VERP elements are addressed, the GMP process could revert to the

production of vague, general documents without clear guidance for visitor use planning and management. VERP implementation plans might, at worst, never be completed, or at best, postponed. One big advantage of VERP being embedded in the GMP is that funding and other resources are allocated for this activity at one time, and all the VERP tasks could be addressed under this umbrella effort. As such, the park, the Denver Service Center, and other collaborators in the process would have a clear vision concerning funding, required tasks, and responsibilities for completing the necessary steps. It now appears that many important questions remain concerning how the most critical elements of the VERP framework (such as elements 7-9) will be accomplished in an implementation plan produced after the GMP is completed.

References

Chilman, K.; Foster, D.; Everson, A. 1990. Updating the recreation carrying capacity process: recent refinements. In: Lime, D.W., ed. Managing America's enduring wilderness resource, proceedings of the conference, September 11-14, 1989, Minneapolis, MN. St. Paul, MN: University of Minneosta Press: 234-38.

Environment Canada and Park Service. 1991. Selected readings on the visitor activity management process. Ottawa, Ontario: Environment Canada.

Graefe, A. R.; Kuss, F. R.; Vaske, J. J. 1990. Visitor impact management: the planning framework. vol. 2. Washington, DC: National Parks and Conservation Association.

Lime, D. W., ed. 1996. Congestion and crowding in the National Park system: guidelines for management and research. Minnesota Agricultural Experiment Station Misc. Pub. 86-1996. St. Paul, MN: Department of Forest Resources and Minnesota Agricultural Experiment Station, University of Minnesota. 144 p.

Lime, D. W. 1995. Principles of carrying capacity for parks and outdoor recreation areas. In: ACTA Environmentalica Universitatis Comenianae (vols. 4 and 5), Carrying capacity and environmental impact assessment seminal, April 3-6, 1995, Bratislava, Slovakia. Univerzita Komenskeho V, Bratislava, Slovakia: 21-29.

Lime, D. W.; Lewis, M. S. 1996. Recommendations and suggested procedures to implement a social monitoring program in the Boundary Waters Canoe Area Wilderness. Final Report to the Superior National Forest, USDA Forest Service. St. Paul, MN: University of Minnesota, Department of Forest Resources. 22 p.

Lime, D. W.; McCool, S. F.; Galvin, D. P. 1995. Trends in congestion and crowding at recreation sites. In: Thompson, J. L.; Lime, D. W.; Gartner, B.; Sames, W. M., comps. Proceedings of the Fourth International Outdoor Recreation and Tourism Symposium and the 1995 National Recreation Resource Planning Conference, May 14-17, 1995, St. Paul, MN. St. Paul, MN: University of Minnesota, College of Natural Resources and Minnesota Extension Service: 87-96.

Manning, R. E.; Lime, D. W. 1996. Crowding and carrying capacity in the National Park system: toward a social science research agenda. In: Lime, D. W., ed. Congestion and crowding in the National Park system: guidelines for management and research. Minnesota Agricultural Experiment Station Misc. Pub. 86-1996. St. Paul, MN: Department of Forest Resources and Minnesota Agricultural Experiment Station, University of Minnesota: 27-65.

Manning, R. E.; Lime, D. W.; Freimund, W. A.; Pitt, D. G. 1996a. Crowding norms at frontcountry sites: A visual approach to setting standards of quality. Leisure Sciences 18(1): 39-59.

Manning, R. E.; Lime, D. W.; Hof, M. 1996b. Social carrying capacity of natural areas: theory and application in the National Parks. Natural Areas Journal 16(2): 118-127.

McCool, S. F.; Christensen, N. A. 1996. Alleviating congestion in parks and recreation areas through direct management of visitor behavior. In: Lime, D. W., ed. Congestion and crowding in the National Park system: guidelines for management and research. Minnesota Agricultural Experiment Station Misc. Pub. 86-1996. St. Paul, MN: Department of Forest Resources and Minnesota Agricultural Experiment Station, University of Minnesota: 67-83.

Mitchell, J. G. 1995. Our National Parks. National Geographic 186(4): 1-55.

Shelby, B.; Heberlein, T. A. 1986. Carrying capacity in recreation settings. Corvallis, OR: Oregon State University Press.

Shelby, B.; Stankey, G.; Shindler, B. 1992. Defining wilderness quality: the role of standards in wilderness management—a workshop proceedings. General Technical Report PNW-305, USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Stankey, G. H.; Cole, D. N.; Lucas, R. C.; Petersen, M. E.; Frissell, S. S.; Washburne, R. F. 1985. The Limits of Acceptable Change (LAC) system for wilderness planning. U.S. Department of Agriculture, Forest Service Gen. Tech. Report INT-176.

U.S. Department of the Interior, National Park Service. 1993. Special report. VERP: a process for addressing visitor carrying capacity in the national park system. Working draft paper. USDI, National Park Service, Denver Service Center, CO. 20 p.

U.S. Department of the Interior, National Park Service. 1995. The Visitor Experience and Resource Protection Implementation Plan: Arches National Park. USDI, National Park Service, Denver Service Center, CO. 72 p.

U.S. Department of the Interior, National Park Service. 1997. VERP: an informational brochure. USDI, National Park Service, Denver Service Center, CO. 2 p.

US Public Law 95-625. 95th Congress. 1978. General Authorities Act.

Vander Stoep, Gail; Roggenbuck, J. W. 1996. Is your park being "loved to death?": Using communications and other indirect techniques to battle the park "love bug". In: Lime, D. W., ed. Congestion and crowding in the National Park system: guidelines for management and research. Minnesota Agricultural Experiment Station Misc. Pub. 86-1996. St. Paul, MN: Department of Forest Resources and Minnesota Agricultural Experiment Station, University of Minnesota: 85-132.

Wilkinson, T. 1995. Crowd control. National Parks. 69(7-8): 36-41.

Appendix A: Elements of the VERP Framework

---- FRAMEWORK FOUNDATION ----

Element 1: Assemble an interdisciplinary project team

A core team is needed, comprised of those people who can develop the plan and those who will implement the plan. A wide variety of consultants with various backgrounds and expertise may be needed to assist the core team.

Element 2: Develop a public involvement strategy

As in any planning effort, the public must be involved in VERP planning. Both NPS staff and publics external to the agency should be considered. A public involvement strategy should be prepared early in the framework.

Element 3: Develop statements of park purpose, significance, and primary interpretive themes; identify planning constraints

These statements form the foundation upon which the VERP plan and implementation strategies are built. All subsequent elements must be consistent with and supportive of these statements. This element may already exist in many parks, having been developed in previous planning efforts. But if this work has not been done, VERP work should not continue until all of these statements are articulated and clearly understood.

---- ANALYSIS ----

Element 4: Analyze park resources and existing visitor use

The objective of this element is to understand as fully as possible the park's resources and existing visitor uses and experiences. This analysis should be documented, usually through a combination of maps, matrixes, and text.

---- PRESCRIPTIONS ----

Element 5: Describe a potential range of visitor experiences and resource conditions (potential prescriptive zones)

Potential zones are described by different desired visitor experience opportunities and resource conditions that could be provided in a given park, consistent with the park's purposes and significance. The zone descriptions prescribe appropriate kinds and levels of activity, development, and management. These potential zones are described in text only; they are applied to specific geographical areas in element 6.

Element 6: Allocate the zones to specific locations within the park (prescriptive management zoning)

In this element the zones described in element 5 are assigned to specific locations within a park. The zoning scheme *prescribes* future conditions; it is not descriptive of existing conditions (although in some cases the continuation of existing conditions could be the desired future). If appropriate, the planning team should develop alternative zoning schemes and assess their beneficial and adverse impacts, consistent with the National Environmental Policy Act.

Element 7: Select indicators and specify standards for each zone; develop a monitoring plan

Indicators (specific, measurable variables that will be monitored) and standards (minimum acceptable conditions) are identified for each zone. A monitoring plan is developed that identifies priorities, methods, funding, and staffing strategies, and analysis requirements.

---- MONITORING AND MANAGEMENT ACTIONS ----

Element 8: Monitor resource and social indicators

Park staff regularly monitors resource and social conditions in various zones. Staff and funding limitations will usually necessitate setting priorities and monitoring only in the most critical areas.

Element 9: Take management actions

When monitoring indicates that social or resource conditions are out of standard or deteriorating toward a standard, management actions must be taken.

Appendix B: Types of Social Science Research

These types of social science research are recommended to refine the VERP and related planning frameworks. Modified from Manning and Lime 1996, McCool and Christensen 1996, and Vander Stoep and Roggenbuck 1996.

Apply and evaluate VERP to the range of Park Service areas nationwide.

- How well do the theories, concepts and processes apply to the variety of units found in the system?
- What methods are most effective to evaluate the application of VERP?
- What criteria should be used to judge how well the framework works?

Broaden research to identify indicators of quality that include more heavily developed and visited frontcountry, historical sites, cultural areas, national recreation areas, and urban parks.

- In such settings to what extent does the quality of the visitor experience have less to do with the number of contacts between visitor groups and more to do with other physical manifestations of use intensity such as traffic congestion, full campgrounds, and waiting in lines?
- How do planner and manager definitions of appropriate indicators of quality compare with visitor definitions?
- Are there "key" indicators that are relatively constant across all types of park units or other settings? Or are there groups of "key" indicators that are relatively constant across selected types or categories of units?
- How well can the quality of the visitor experience be reduced to a set of specific, measurable variables?

Expand research concerning standards of quality—especially research on social norms and for a variety of indicator variables.

- Do visitors to parks and related areas have valid norms concerning appropriate use levels and other potential indicators of quality?
- A closely related question concerns the degree to which visitor behavior conforms to visitor norms (norm congruence).
- To what extent do visitors or subgroups of visitors agree about norms concerning appropriate use levels (crystallization)?
- How should norms be measured—such as using a narrative format or responses to visual patterns?
- How do personal and social norms concerning crowding and other indicators of the quality of the visitor experience evolve or change over time?
- Normative research should continue to address questions about geographic differences within park and recreation settings as well as temporal patterns.

Further research on monitoring indicators of quality to identify strategies that are reliable, cost efficient, and easily operationalized by field personnel.

- Testing of procedures seems especially needed to compare findings from diverse areas and conditions.
- Once applied in the field, research should evaluate whether or not procedures justify the time and resources necessary to operate them.
- What role can geographic information systems (GIS) play as a medium to display information about indicators and standards of quality?
- A closely related question concerns what role monitoring data can serve to inform and educate visitors (such as using the Internet) about resource conditions, availability of facilities and services, visitor use patterns, and other components of a quality experience.

Initiate research to assess whether or not a standardized zoning or ROS-type system for describing visitor opportunities can be developed and applied to the range of areas within the national park system or other systems.

- Can a standardized zoning or ROS-type system for describing visitor opportunities be developed for the national park system or other public land management agencies?
- Are the three components of carrying capacity (social, environmental, and managerial) appropriate to defining the diversity of visitor opportunities across the national park system, for example?

Intensify research on the coping behaviors of current and potential visitors—particularly regarding questions concerning displacement, substitution, and rationalization (the way visitors change their views of a situation).

- To what extent is visitor displacement a problem in leisure settings, and what social impacts are responsible for displacement?
- Could a regional or national study approach (including general population studies) be useful in analyzing visitor displacement? If visitors are being displaced, are substitute areas available?
- To what extent are cognitive coping behaviors employed by visitors to National Park Service and other areas? If visitors are employing a product shift strategy, does this mean such systems increasingly are providing more highly developed areas in the minds of visitors? If so, does this mean these areas can (should) accommodate ever increasing levels of visitor use?

Evaluate the effectiveness of various management strategies, tactics, and actions to address impacts of visitors on biophysical resources and the experiences of other visitors.

- Studies to evaluate various management tools are especially needed in frontcountry areas, in natural resource settings, cultural sites, historical areas, and urban locations. Results should not be considered transferable without much more study.
- How can the potential diversity of visitor management practices and actions best be organized and presented to practitioners?
- What are the social and administrative costs of direct management techniques (direct strategies rely on regulation of behavior)?

- To what extent are visitors willing to tradeoff decreased freedom under a direct management strategy for increased access to a site under indirect management (emphasizing information and education)?
- How does the desirability of a direct management technique differ from its acceptability?
- Which techniques along a continuum of possible management solutions provides the most equitable outcome (fairness) in a given situation?
- Determine under what conditions incentives, rewards, and punishment are appropriate in shaping visitor behavior in leisure settings; determine the relative effectiveness of each of those strategies; and determine which, if any, results in long-term behavior change.
- What messages are given to park visitors about appropriate park behavior based on environmental cues (such as design and maintenance standards), and how do these cues shape behavior?
- How effective are various information, education, and persuasion programs in park settings at teaching a long-term low impact ethic?
- What visitor characteristics (including cultural differences and in what situations) influence the effectiveness of information, education, and persuasive communication?

Application of LAC-Type Processes and Concepts to Nonrecreation Management Issues in Protected Areas

Linda Merigliano
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David J. Parsons

Abstract—When Limits of Acceptable Change concepts are applied to nonrecreational issues, two primary problems are encountered: (1) developing zoning schemes which are compatible when multiple issues are addressed, and (2) defining the desired condition and establishing measurable standards for ecosystem attributes which change in unpredictable ways. Approaches to overcome these two difficulties are described. We conclude that LAC can and should be used to address many impacts that are not related to recreational use. Where impacts are localized, nearby reference sites are often available, thus LAC standards can be developed for the amount of acceptable deviation from conditions at the reference site. However, effects-based, measurable standards may be impossible to define for landscape-scale impacts where no undisturbed reference sites exist. Three approaches to overcome the problem with changeable ecosystem attributes are substituting time as a reference, using system inputs rather than outcomes, and identifying the desired direction of desired change without specifying a standard. Each approach has drawbacks.

Why Address Nonrecreational Issues?

The development of LAC-type concepts grew out of problems with defining carrying capacities for recreational use. As such, LAC was originally intended to address issues associated with recreational impacts to wildlands and visitor experience (Stankey and others 1985). However, as a result of the success of pilot-testing LAC in the Bob Marshall Wilderness Complex and the need to develop management direction for all protected areas, use of the LAC process has become more widespread. The process was immediately applied to issues other than recreational impacts. Fire management, air pollution/visibility, exotic plant invasion, domestic livestock grazing, fish stocking, and impacts to wildlife illustrate the diversity of issues included in LAC applications. Four primary reasons stand out as to why managers began to apply the LAC process to nonrecreational issues:

1. Increased emphasis on wilderness as more than a recreation resource. Many wilderness managers did not feel they were fulfilling their responsibility to meet the intent of the Wilderness Act if recreation issues were the only ones addressed.

2. Citizen interest and public input. Public and agency input gathered in the first step of LAC often identified nonrecreation issues and managers wanted to be responsive. In some cases, even if managers tried to limit the scope of planning efforts, citizens were unwilling to participate unless nonrecreational issues were addressed or would charge managers with unwillingness to tackle tough issues.

3. Lack of full understanding about LAC. Publications on LAC did not explicitly state how LAC was different from other planning frameworks and did not identify the types of problems LAC could or couldn't address and why. Dissatisfaction with traditional planning frameworks or lack of knowledge about alternative approaches contributed to managers latching onto LAC without questioning whether or not it was well-suited to address nonrecreational issues.

4. Increased emphasis on an ecosystem approach to resource management. An ecosystem approach necessitates exploring how the whole system works. Due to the multitude of activities occurring in wilderness and problems created by conflicting management direction, managers felt a responsibility to develop plans that address all the issues rather than single out recreational impacts.

Problems with Applying LAC to Nonrecreational Issues

At least five difficulties have surfaced in attempts to apply the LAC process beyond recreation to other human activities which impact wilderness.

1. When numerous threats are considered simultaneously, zoning developed for one threat (such as recreation) may not be compatible with zoning developed for another threat (such as grazing or fire suppression).

2. Many ecosystem characteristics are so inherently changeable that it may be impossible to define the "ideal" condition and develop measurable standards for minimally acceptable conditions. How do we write standards that are "lines in the sand" when the system is inherently chaotic?

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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3. Inadequate knowledge about ecological systems and the nature or significance of various human activities makes it difficult to identify appropriate indicators and management strategies.

4. Where current ecological conditions are determined to be unacceptable, managers must decide between two undesirable courses of actions. They must either manipulate wilderness conditions which contradicts the intent of the Wilderness Act, or, to avoid conscious manipulation, they must allow conditions to increasingly diverge from what is thought to be "natural" (Cole 1996).

5. Managers often fail to implement plans, either due to insufficient resources (to accomplish monitoring, for example) or lack of political will (reluctance to risk allowing natural fire to burn, for example).

The last three difficulties appear surmountable, although clearly challenging. The LAC process or any other framework will fail unless we increase our commitment to professional wilderness stewardship. To identify appropriate indicators and management strategies we need to invest in scientific studies to more fully understand how human activities are altering wilderness ecosystems and the consequences of alternative management strategies. To address the dilemma posed by the conflict of avoiding direct manipulation of wilderness landscapes, yet also restoring natural conditions, criteria could be developed to provide guidance on when manipulation was deemed appropriate (the conditions under which the benefits of restoring natural conditions outweighed the disadvantages of actively manipulating landscapes). We could also design experimental approaches to more fully understand the consequences of active manipulation versus natural regulation strategies. To address the failure to implement plans, society needs to allocate more resources to wilderness stewardship and demand more courageous management. The LAC process, or any other process that clearly defines what is to be achieved, should facilitate this because management needs are made explicit. If insufficient resources or lack of political will results in objectives or LAC standards not being met, the shortcomings are more easily identified either by managers or public "watchdogs."

The first two difficulties—incompatible zones and defining standards for changeable systems—may not be so readily surmountable. In other words, even if we substantially increase our commitment to wilderness stewardship, these two problems may still limit the application of LAC beyond recreation use issues. However, an examination of these problems may shed light on which issues LAC (at least as it was originally conceived) can effectively deal with and which issues it cannot. Even more productively, an analysis of these problems may reveal how the LAC process could be modified to improve its effectiveness. The rest of this paper explores the difficulties and possible approaches associated with zoning and standards.

Problems with Incompatible Zones

When nonrecreation issues are considered along with recreation issues, development of opportunity classes (zoning) becomes problematic since zoning to deal with one issue may be incompatible with zoning for another issue. For example, a zoning scheme for wilderness recreation experience opportunities (based on number of encounters between groups, degree of trail development and degree of campsite impact) may be quite different from a zoning scheme for fire management (based on vegetation type and fuel loading) or a zoning scheme for domestic livestock grazing (based on rangeland suitability).

Two problems are apparent. First, the lines that define zones may not coincide at all. Second, direction appropriate for one zoning scheme may create conflicts when another zoning scheme is considered. For example, a zoning scheme based on the vegetation resource may define parts of the wilderness as capable of supporting lots of cattle. However, when zoning for recreation experiences is considered, this area may best provide opportunities to encounter few other groups with little evidence of camping activities. The visitor to this area seeking outstanding opportunities for solitude may find it highly incongruous to encounter domestic livestock or heavily grazed meadows. The LAC concept was originally intended to balance conflicting goals within one topic of concern (for example, balancing the desire for natural conditions and high quality experiences with the desire for public access to be as unrestricted as possible). The situation where multiple inputs (such as both recreation use and livestock grazing) influence a single outcome (such as quality visitor experiences) was not addressed.

Three approaches have evolved to address the problem of incompatible zoning:

1. Identify one outcome (such as quality visitor experiences) as the primary "driver" and develop zoning accordingly. Integrate direction for other issues within this zoning scheme. For example, where crucial wildlife habitat exists, the zone is mapped to only provide opportunities for experiences offering high solitude and little evidence of human activity. However, integrating other resource concerns such as fire management has been analogous to forcing a square peg into a round hole. Attempts to alter fire management prescriptions to fit different recreation zones have been viewed as artificially constraining prescriptions beyond what is already imposed by policy mandates.

2. Develop multiple overlays with separate zoning schemes for each issue. Such an approach creates high complexity that makes public understanding and implementation difficult. To determine direction for one particular area, multiple layers must be consulted. There may be zones allowing both a high recreational and grazing impact, zones allowing high recreational and low grazing impact, zones allowing low recreational and high grazing impact, and so forth. This situation creates a high potential for incompatible direction.

3. Constrain mapping of zones. For example, direction for the most "primitive" recreation experience (with few encounters with others, no developed trails, and little to no evidence of campsites) often also includes lack of encounters with domestic livestock (except pack and saddle stock). Typically, this has meant such zones must be mapped outside of existing grazing allotments. Such an approach has not been satisfactory to a variety of public interests.

When LAC concepts are applied to issues beyond recreation, zoning problems can be overcome. However, none of the approaches have proven particularly satisfactory. In practice, managers have often resorted to using zoning only

for a few topics of concern and abandoning zoning for other topics so that direction for these topics applies wilderness-wide (for example, direction for livestock grazing applies wherever allotments exist; direction for fire management applies to any fire start). Zoning is still primarily used to address recreation visitor issues but has been used to address recreational packstock grazing and has been proposed for managing fish stocking (Bahls 1992; USDA Forest Service 1987). More attempts to integrate multiple issues using LAC concepts are needed to assess the severity of zoning problems. It may only mean that management complexity increases or that we need to spend more time articulating goals and establishing a clear hierarchy among multiple conflicting goals so that compromises are more explicit.

Problems with Defining Desired Conditions and Standards

The problem that may most limit the application of LAC to ecological integrity issues most—regardless of scientific knowledge and commitment of resources—is the difficulty of defining desired conditions (the "ideal") and measurable standards for dynamic ecosystem attributes. Standards should be measurable, attainable and applicable into the future. When the desired condition of an attribute does not change over time, it is relatively straightforward to develop a standard that defines how much deviation we are willing to accept from the desired condition. For example, we may define a minimally acceptable state of "no more than one other campsite within sight or sound." This standard is meaningful into the future because we can define a desired condition of "no occupied campsites within sight or sound" that should be applicable over time. We may change our mind in the future about how many occupied campsites within sight or sound are acceptable but this would reflect a change in our value judgment about solitude while camping rather than a change in the desired condition.

This approach also works for some ecological attributes. For example, the needle surfaces of western conifers subjected to ozone pollution show a distinct visible discoloration known as chlorotic mottling (Stolte and others 1992). This symptom is virtually never exhibited in the absence of ozone pollution. This allows us to define a desired condition —no chlorotic mottling—and we can develop a standard for an acceptable level of chlorotic mottling that is both measurable and meaningful in the future. In these cases, we may change our mind in the future about the standard but any change would reflect a change in our value judgement about acceptable deviation from the desired (for example, if we learn that chlorotic mottling is more or less detrimental than we thought, we may change the standard, but the desired condition will always remain "no chlorotic mottling"). However, for conditions that change over time (for example, vegetation or wildlife populations), the desired condition of "protecting natural conditions or processes" cannot be well-defined because we do not know with any precision what "natural conditions" ought to be like. The shortcomings of some standards commonly used to address nonrecreational issues are displayed in table 1.

Table 1—Shortcomings of standards commonly used to address nonrecreational issues.

Topic	Desired condition	Indicator	Standard	Shortcomings
Air quality	Air quality including visibility is not impaired by human activities (affected primarily by the forces of nature with the effect of human activities substantially unnoticeable)	Acid neutralizing capacity	Alkalinity will not be reduced more than 10 percent of the baseline for waterbodies with capacity greater than 25 meq/liter (micro-equivalents/liter)	Difficulty defining what "baseline" means. Promotes static systems
		Visibility	Maximum of 5 percent change in visual contrast compared to best visibility days (90th percentile)	90th percentile conditions represents a moving target. If set for certain time period, promotes static systems
		Lichens	Maximum or 5 kilograms per hectare of depositional sulfate	Uses system input (pollutant) rather than effect of pollutant on lichens
Range condition	Forage is used in a manner that allows meadow conditions (structure, composition, and processes) to be affected primarily by the forces of nature with the effect of human activities substantially unnoticeable	Forage utilization	Maximum of 40 percent utilization on key forage species	Uses system input rather than (forage utilization) effect of given level of utilization on meadow condition
		Range or meadow condition	At or trending towards potential natural condition (PNC)	Dependent on availability of undisturbed reference sites to define PNC. Strictly using PNC may promote static systems (con.)

Table 1 (Con.)

Topic	Desired condition	Indicator	Standard	Shortcomings
Aquatic condition	Aquatic conditions are not impaired by human activities (affected primarily by the forces of nature...)	Streambank stability	At least 80 percent of the natural streambank stability is maintained	Dependent on availability of undisturbed reference sites to define PNC. Strictly using PNC promotes static system
		Riparian species composition	Streambank vegetation is maintained at minimum of 85 percent of potential natural condition	Dependent on availability of undisturbed reference sites to define PNC. Strictly using PNC promotes static system
Fire	Permit lightning caused fires to play, as nearly as possible, their natural ecological role. Reduce, to an acceptable level, the risks and consequences of fire within wilderness and escaping from wilderness	Appearance of suppression activities	Evidence of suppression activities will not be noticeable within 1 year	What is considered "noticeable" may vary among observers
		Number of percent of natural ignitions suppressed, risk of escapement	No more than 5 percent of natural ignitions are suppressed over a 10 year period. Natural ignitions are allowed to burn unless the risk of escapement (burning adjacent property or resource values) is greater than 10 percent	Uses system input (fire suppression) rather than the effect of fire suppression on the free play of natural processes
Exotic plant invasion	Native plant communities are maintained in their natural condition without the occurrence of exotic plant species	Number of acres or percent of area occupied	Regionally designated exotic weeds occupy no more than 2 percent of the wilderness acres. Aggressive invaders are not present	Uses system input (presence of weeds) rather than effect of weeds on native plant communities
Wildlife	Provide an environment where the forces of natural selection and survival rather than human actions determine which and what numbers of wildlife species exist. Protect threatened or endangered species and their habitat and aid in their recovery	Population objective	Meet State population objective for moose (or other game species)	Promotes static condition rather than allowing natural processes to determine population numbers
		Compliance with species recovery plan	At least 90 percent compliance with food storage regulations in grizzly bear habitat	Uses system input (visitor behavior) rather than effect on bear population. Difficult to determine the relative significance of multiple factors impacting wildlife

The problems associated with changeable natural systems can be overcome in a satisfactory manner if the impact is *localized* or the concern is limited to the *presence* of a change agent (such as an invader species) rather than the *effect* of the change agent on the ecosystem. For example, with exotic invasions, the desired condition can be defined as "no invaders" (thus, is not changeable) and a standard can be written to define an acceptable deviation from the desired in terms of acres or numbers of invaders. When an impact is localized, undisturbed reference sites are often available nearby, thus standards can be written to specify the amount of acceptable deviation compared with off-site reference sites. In the example above, even if the concern is the *effect* of the invader on the ecosystem, we could write a standard defining the acceptable deviation in species composition of communities that have been invaded compared with reference sites, *if* the invasion is localized.

Similarly, writing a standard for the acceptable amount of vegetation cover on campsites is problematic because the "natural" amount of vegetation varies from site to site and changes from year to year with such climatic factors as amount of precipitation. However, the standard can be written as "no more than 50 percent less vegetation cover on campsites compared with reference sites." Vegetation cover, both on the campsite and reference site, can fluctuate with the vagaries of environmental change, but the 50 percent deviation remains constant into the future.

Defining standards as the amount of acceptable deviation from a reference site should be applicable to most recreation impacts, localized grazing impacts, mining impacts, many exotic invasions (those in which invaded places can still be compared with noninvaded places), and many stream diversions. However, this approach appears unlikely to work for managing impacts at the landscape scale, such as air pollution, fire suppression and management, widespread grazing, landscape fragmentation, and impacts to large mobile animals. For these influences there are no relatively undisturbed reference sites in the landscape.

Potential Solutions to the Lack of Reference Sites

Three possible approaches can be suggested as ways to develop explicit management direction for landscape-scale impacts when no relatively undisturbed references sites exist. These approaches are (1) substituting time as a reference, (2) defining standards based on inputs rather than outcomes, and (3) identifying monitoring indicators and the direction of desired change but not setting standards.

Substituting Time as a Reference

One approach to the problems associated with dynamic natural systems is to substitute a reference time for a reference site (Kaufmann and others 1994). The idea is to describe conditions (either in structure or process terms) during a past time when undesirable human influence was absent. Then a standard is written as an acceptable deviation between existing conditions and this past reference state. Two substantial difficulties with this approach are (1) the challenge of describing past conditions and (2) the arbitrariness of deciding on the reference time to use. This forces managers to address issues such as whether or not the influence of Native Americans should be considered desirable. Although challenging, these difficulties are often surmountable, particularly for landscapes that change slowly. Some characteristics of past ecosystems can be described with considerable precision (see, for example, Swetnam 1993) and consensus can frequently be reached on an appropriate reference time.

However, even when past conditions can be described and consensus exists on an appropriate reference time, this approach has the drawback of promoting static rather than dynamic systems. In 1963, a Commission chaired by Starker Leopold issued the recommendation that National Parks be managed to present a "vignette" of primitive America (Leopold and others 1963). This recommendation has been criticized as being out of touch with modern ecology, which reveals that natural ecosystems are characterized by constant change (Botkin 1990).

Some have argued that the problem of static management can be circumvented by developing desired conditions that incorporate a historical range of variability (Morgan and others 1994). This approach allows for more variation and, therefore, is an improvement; however, it limits variability to that measured during a given window of time. Moreover, this approach does not allow for a trajectory of change over time. Ironically, what we have learned about ecosystem behavior from historic ecological data—that ecosystems constantly change in novel and unpredictable ways—is the precise reason we must be careful about using historic data to develop standards for future wilderness ecosystems. Establishing future desired conditions on the basis of past conditions—even if they incorporate some degree of historic variation—may be better than developing no targets at all, but it is far from the ideal of permitting the free play of natural processes. Furthermore, such an approach may force managers into manipulating conditions to restore a particular vegetative condition diminishing the ability to learn how relatively undisturbed systems work.

Defining Standards Using System Inputs

When the LAC process was developed, it advocated developing standards for outcomes (wilderness conditions) rather than inputs (human activities). For example, a standard for number of encounters between groups is preferable to a standard for amount of recreational use because it more directly relates to the goal (ensuring opportunities for solitude). A recent report by the Ecological Society of America about ecosystem management noted that objectives should be stated in terms of "future processes and outcomes" rather than management activities and other inputs (Christensen and others 1996). Outcome standards are preferred because it is the outcome we really care about and because outcomes may be influenced by several inputs. Nevertheless, if we cannot define acceptable outcomes, perhaps the best remaining option is to define acceptable inputs.

For example, it has been shown that air pollution can reduce tree growth rates (Adams and Eagar 1992). We may be unable to define a standard for future tree growth rates

because (1) future growth rates will differ from current rates due to natural climate change and (2) all trees in the future may be adversely affected by air pollution. However, this problem may be circumvented by using the knowledge derived from studies of pollutant effects on tree growth rates to set maximum acceptable levels of air pollutants. By keeping human activity inputs (air pollutants in this case) to acceptable levels, we should keep resultant outcomes within acceptable levels. A key to making this approach work is developing the knowledge of cause-and-effect relationships necessary to model the outcomes likely to result from different levels of input.

Similarly, the maximum allowable number of animals has often been used to define the acceptable level of grazing impact rather than defining acceptable compositional or soil change in meadows. For fire management, we could define a standard for the number of natural ignitions that are suppressed, rather than for the forest structure and composition we really care about. In practice, this approach has been used to write a standard that says, "lightning fires are suppressed only when one or more of the following criteria are met: likely to escape wilderness boundaries resulting in loss of valuable resources outside wilderness, creates unacceptable smoke in communities, protection of life is not assured, there are inadequate fire personnel to manage the fire." Such a standard might be improved by incorporating an acceptable degree of risk within each of the criteria. However, with both of these examples, it is critical to develop more precise models of the relationships between inputs and outcomes. How does the number of grazing animals affect meadow composition? How does the number of suppressed natural ignitions affect forest composition?

Using system inputs to define standards will not work well in situations where it is the removal of an input that is causing the impact we care about. Examples include the loss of predators, disruption of animal movements outside the wilderness, and fire management in systems where most fires burned into the area, instead of igniting within the area.

Identifying Direction of Desired Change Without Setting Standards

There may be issues for which we simply cannot specify desired conditions with any precision because conditions are constantly changing, there are no reference sites in the landscape, we do not want to promote static conditions, and we consider input standards to be ineffective (for example, where there is little information on cause-and-effect relationships). In these situations, if there is consensus that current conditions are unacceptable and consensus about the desired direction of change, we can begin to improve conditions. We can implement management actions, monitor conditions to evaluate progress away from currently unacceptable conditions and conduct research to adjust future management.

Fire management provides a good example. In many wildernesses, it is clear that forest structure has changed markedly as a result of fire suppression. In many places we know that a forest structure with fewer saplings, fewer total trees, fewer vertical layers, and more discrete spatial aggregations of trees would be closer to "natural" than the existing structure (Kilgore 1987). We also know that fire characteristics have changed. Before the recent era of fire suppression, fires in some vegetative types were more frequent and typically smaller and less intense than they are today (see for example Swetnam 1993). From analysis of historic ecological data (Stephenson and others 1991) we can develop past forest structure and fire process descriptors that might make reasonable short-term targets. Even though desired long-term forest structure or process objectives are uncertain, there is often agreement that more fire in the landscape is desirable. Therefore, we can develop management prescriptions that will provide for more fire in the landscape and can be easily adjusted as more is learned.

Additional research will be needed to aid understanding of ecosystem change, although it is unclear whether new research could eventually provide precise standards or would simply show the need for adjustments to management prescriptions. To aid understanding of ecosystem change, simulation models could be developed that estimate the trajectory of natural climate change. This would require differentiating between human-caused and natural change and removing the human component from observed climate change. Estimates of natural change, coupled with understanding of effects of climate change on fire processes and vegetation structure, could provide the basis for more precise targets that incorporate the inherent changeability of natural ecosystems.

Conclusions

We conclude that the LAC process can be used to manage threats to wilderness ecosystem integrity other than recreation. Effective preservation of wilderness ecosystems will require greater commitment of resources to threats-based research, monitoring, and wilderness management. This is simply the cost of professional management. However, LAC applications are more problematic for some threats to ecological integrity than for others. We believe the fundamental application problem is the difficulty of writing standards in situations where (1) desired conditions cannot be well-defined due to "chaotic" variability in the system, and (2) impacts are not localized.

LAC standards may be impossible to define for landscape-scale impacts with no undisturbed reference site. Two approaches to overcome this problem involve relatively little departure from traditional LAC concepts. Standards could be written as deviations from historic predisturbance conditions. This approach suffers from a tendency to promote stasis. Theoretically, this deficiency could be mitigated by developing simulation models capable of identifying natural trajectories of ecosystem change and calibrating standards accordingly. Alternatively, standards could be written for inputs rather than outcomes—defining maximum levels of human input, as opposed to minimally acceptable wilderness conditions. This approach will not work for all threats and requires substantial understanding of the linkages between human-related activities and wilderness conditions.

The final alternative represents a substantial departure from the LAC concept, in that standards would not be developed. The direction of desired change would be identified, but no minimally acceptable condition would be specified. Management would be incrementally refined as more is learned but what constitutes "success" would not be known with any precision. Further elaboration of exactly how this process might work seems worthwhile.

References

Adams, Mary Beth; Eagar, Christopher. 1992. Impacts of acidic deposition on high-elevation spruce-fir forests: results from the Spruce-Fir Research Cooperative. Forest Ecology and Management. 51: 195-205.

Bahls, P. 1992. The status of fish populations and management of high mountain lakes in the western United States. Northwest Science. 66(3): 183-193.

Botkin, Daniel B. 1990. Discordant harmonies. New York, NY: Oxford University Press.

Christensen, Norman L.; Bartuska, Ann M.; Brown, James H.; Carpenter, Stephen; D'Antonio, Carla; Francis, Robert; Franklin, Jerry F.; MacMahon, James A.; Noss, Reed F.; Parsons, David J.; Peterson, Charles H.; Turner, Monica G.; Woodmansee, Robert G. 1996. The report of the Ecological Society of America committee on the scientific basis for ecosystem management. Ecological Applications. 6: 665-691.

Cole, David N. 1996. Ecological manipulation in wilderness: an emerging management dilemma. International Journal of Wilderness. 2(1): 15-19.

Kaufmann, Merrill R.; Graham, Russell T.; Boyce, Douglas A., Jr.; Moir, William H.; Perry, Lee; Reynolds, Richard T.; Bassett, Richard L.; Mahlhop, Patricia; Edminster, Carleton B.; Block, William M.; Corn, Paul Stephen. 1994. An ecological basis for ecosystem management. Gen. Tech. Rep. RM-246. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 22 p.

Kilgore, Bruce M. 1987. The role of fire in wilderness: a state-of-knowledge review. In: Lucas, R. C., comp. Proceedings—national wilderness research conference: issues, state-of-knowledge, future directions; 1985 July 23-26; Fort Collins, CO. Gen. Tech. Rep. INT-220. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 70-103.

Leopold, A. S.; Cain, S. A.; Cottam, C. M.; Gabrielson, I. N.; Kimball, T. 1963. I. Study of wildlife problems in National Parks: wildlife management in National Parks. In: Transactions of the North American Wildlife and Natural Resources Conference. 28: 28-45.

Morgan, Penelope; Aplet, Gregory H.; Haufler, Jonathan B.; Humphries, Hope C.; Moore, Margaret M.; Wilson, W. Dale. 1994. Historical range of variability: a useful tool for evaluating ecosystem change. Journal of Sustainable Forestry. 2: 87-111.

Stankey, George H.; Cole, David N.; Lucas, Robert C.; Petersen, Margaret E.; Frissell, Sidney S. 1985. The Limits of Acceptable Change (LAC) system for wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Stephenson, Nathan L.; Parsons, David J.; Swetnam, Thomas W. 1991. Restoring natural fire to the sequoia-mixed conifer forest: should intense fire play a role? In: Proceedings 17th Tall Timber fire ecology conference, high intensity fire in wildlands: management challenges and options. Tallahassee, FL: Tall Timbers Research Station: 321-337.

Stolte, K. W.; Duriscoe, D. M.; Cook, E. R.; Cline, S. P. 1992. Methods of assessing responses of trees, stands and ecosystems to air pollution. In: Olson, R. K.; Binkley, D.; Bohn, M., eds. The response of western forests to air pollution. New York, NY: Springer-Verlag: 259-330.

Swetnam, T. W. 1993. Fire history and climate change in giant sequoia groves. Science. 262: 885-889.

U.S. Department of Agriculture, Forest Service. 1987. Recreation Management Direction: Bob Marshall, Great Bear, Scapegoat Wildernesses. Forest Service—Flathead, Lolo, Helena, Lewis and Clark, Montana.

Beyond Wilderness: Broadening the Applicability of Limits of Acceptable Change

Mark W. Brunson

Abstract—The Limits of Acceptable Change (LAC) process helps managers preserve wilderness attributes along with recreation opportunities. Ecosystem management likewise requires managers to balance societal and ecosystem needs. Both are more likely to succeed through collaborative planning. Consequently, LAC can offer a conceptual framework for achieving sustainable solutions outside protected areas. Nonwilderness management has more complex objectives and constituencies, but the basic progression of issue identification, standard-setting, impact monitoring, and strategies for mitigating unacceptable impacts can be applied nonetheless. A major conceptual shift is required, however, in that the objective of ecosystem management often is not to restrict anthropogenic change but to direct it.

The Limits of Acceptable Change (LAC) process for wilderness planning was devised because managers found it increasingly difficult to balance the often-conflicting mandates of the Wilderness Act to administer lands "for the use and enjoyment of the American people" while providing "for the protection of these areas, the preservation of their wilderness character" (16 U.S.C. §1131(a)). Accordingly a planning process was developed that accounted for the reality that anthropogenic change is inevitable wherever human activity is encouraged, yet established the protection of nonhuman ecosystem elements as a primary management goal. Management strategies based on LAC planning are *adaptive*, that is, they call for ongoing observation of the interactions between humans and the wilderness environment, and they provide mechanisms to quickly change strategies if observed conditions do not match desired outcomes (Stankey and others 1985). Moreover, LAC plans are said to be most viable—that is, most likely to be ecologically and socially sustainable—when they are developed with the participation of constituency groups to ensure broad public scrutiny of planning objectives and management standards (McCoy and others 1995).

The same goal of socioeconomic and ecological sustainability has become central to the task of U.S. public land management in general, both within and outside wilderness. Many public land agencies in North America have adopted ecosystem management, which differs from previous approaches by focusing more attention on ecological properties of landscapes and encourages the integration of a wider range of societal values into a multiple-use framework (Salwasser 1994). Like LAC-based plans for wilderness management, ecosystem management strategies are supposed to be adaptive—entailing a process of learning from experience whereby we increase our understanding of the reciprocal relationship between natural systems and social systems across time and space (Lee 1993). And typically they incorporate collaborative planning efforts involving diverse constituencies who are charged with finding achievable, mutually agreed-upon goals for conditions of a landscape of common interest (Muckenfuss 1994; Swanson 1994).

Given that the goals and strategies of ecosystem management are similar to those of wilderness management, LAC planning may provide a framework for developing ecosystem management strategies outside wilderness and protected areas. This is important because agencies charged with facilitating ecosystem management collaboration are struggling to find processes appropriate to that purpose (Brunson and Richardson 1997; Torell 1993). It is entirely possible that the required expertise already resides in their wilderness management staffs. Accordingly, this paper examines the applicability of LAC beyond protected areas, with particular attention paid to issues of increased management complexity, meanings of "acceptability," and conceptual or procedural adaptations for nonwilderness lands.

Broadening the Scope of LAC

Nonwilderness Applications

Although LAC was originally envisioned as a tool specific to problems of wilderness management, its application has broadened slowly but surely in the ensuing 15 years. In 1989 a plan developed for the Arapaho-Roosevelt National Forest applied the LAC model to campsites and day-use areas in the Poudre Wild and Scenic River in Colorado. Most of the area fell into the Roaded Natural category of the Recreation Opportunity Spectrum. The indicators chosen were ones that previously had been applied successfully in wilderness (amount of vegetative cover; tree damage; bare ground; existence/extensiveness of access trails; user modification; amounts of litter, wastes, and vandalism), and standards were set at levels similar to those for heavily used wilderness areas (Brunson and Rodriguez 1992).

The Poudre plan applied LAC in a protected-area setting that, though in the "front country," is legally similar to wilderness. A more widespread application of an LAC-type process is the National Park Service's Visitor Experience and Resource Protection (VERP) process, which also is

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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intended as a way for managers to meet objectives for desired ecological and social conditions, but can be applied to the full gamut of National Park settings. Like LAC, VERP requires a baseline assessment of natural resource conditions and visitor experiences, establishes desired conditions for a range of management zones, uses monitoring to compare observed impacts with standards for conditions, and develops strategies for addressing discrepancies between impacts and standards (Manning and others 1996). VERP differs from LAC in some particulars, including a heavy emphasis on "recreation carrying capacities" and virtually no provision for participatory planning, but its general structure is quite similar to LAC.

An LAC application outside of protected areas was made in 1992 by the Payette National Forest, which used an LAC process to develop a winter recreation plan for ranger districts headquartered in McCall and New Meadows, ID (Fitch 1993). Issues addressed by the plan included some outside the scope of wilderness planning, such as conflict between motorized and nonmotorized users. Although some LAC steps were curtailed in the Payette process—for example, existing recreation inventory data were used in lieu of an inventory of current resource and social conditions—the process was chosen as a general outline for the winter recreation planning process because it offered a tested framework for collaborative planning. In general, participants considered the LAC approach a successful one and supported its broader use in recreation planning (Fitch 1993).

Other nonwilderness LAC efforts include an application to a Bureau of Land Management area of critical environmental concern (ACEC) along the South Fork of the Snake River in southeastern Idaho, where riparian protection was a principal concern. Undoubtedly there have been other attempts at applying LAC outside wilderness, with varying degrees of success. Unfortunately, field-level managers rarely have the opportunity to document those efforts and disseminate the results of their experiences to the wider audience of Federal, State, and international wildland managers who might benefit by them. Research that assembles and synthesizes these case histories might be especially helpful to managers seeking to apply LAC outside wilderness.

Difficulties of Nonwilderness LAC

One barrier to nonwilderness applications of LAC planning may be that managers traditionally have thought of wilderness management as a separate task from multiple-use management. To some extent this distinction is unwarranted because wilderness areas are multiple-use under the legal definitions in both the Multiple Use Sustained Yield Act of 1960 (MUSYA) and Federal Land Policy and Management Act of 1976 (FLPMA). In both laws, multiple-use means making "the most judicious use of the land" and that "some land will be used for less than all of the resources" (16 U.S.C §531(a); 43 U.S.C. 1702(c)). The FLPMA further requires land managers to take into account "the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific, and historical values" (43 U.S.C., §1702(c)). With the exception of timber and minerals, those resources are explicitly included in descriptions of wilderness management in the 1964 Wilderness Act or subsequent laws. Wilderness *is* "multiple use."

Nonetheless, nonwilderness management issues are clearly more complex, given the broader spectrum of allowable uses. Cole and Stankey (this proceedings) have conceptualized LAC as a process that focuses on the tension between opposing goals of providing access to primitive recreation and protecting wilderness resources from human impacts. Their bipolar model can quickly seem unmanageable when there are three or more management goals for a landscape, and those goals are at least partially incompatible. A potential resolution to this dilemma lies in development of an LAC process that establishes a hierarchy among incompatible goals, thus defining which will be the ultimately constraining factor within each potential pair of goals. (This idea is discussed in detail below.)

A chief difference between wilderness and nonwilderness planning is that the latter has heightened potential for conflict between constituency groups. Floyd (1993) suggests that land use conflicts are most intense where there are legitimate demands for both nonrenewable commodities and preservation amenities. In subsequent tests of his conflict model, he found that it predicted intensity of conflict well *except* that conflicts over motorized versus nonmotorized recreation uses were more intense than predicted (Germain and Floyd 1996). We can expect conflicts to be more intractable in ecosystem management applications of LAC than in wilderness applications. Still, that is primarily a problem with the collaborative planning element of LAC, not with the process itself, and collaborative planning will occur for ecosystem management regardless of whether LAC or another approach is used.

Another significant problem is that management of nonwilderness resources often is subject to vague or conflicting legislative mandates (Brunson and Rodriguez 1992). Because "multiple use" does not mean that all allowable uses must be provided everywhere, disputes over planning for multiple-use landscapes may focus on whether a particular use is acceptable at all—a much more intractable issue than deciding levels of impacts that are acceptable for allowable uses. We may find that LAC should not be applied until a broad "desired future condition" for a landscape is determined that includes a description of allowable uses. At that point, LAC may be helpful for establishing specific aspects of that condition, and for setting forth management strategies to preserve that condition.

Some legal mandates appear inherently contradictory, making the legal basis for planning objectives less clear. LAC processes may be especially useful in such situations. For example, when Congress established the Arapaho National Recreation Area in Colorado, it called for the "conservation and development of the scenic, natural, historic, and pastoral values of the area," and also provided for mining, timber harvest, and grazing where it will not "substantially impair the purposes for which the recreation area is established." The law did not provide much guidance on how to ensure that "conservation" and "development" are compatible, nor on how to determine when commodity development impairs recreation purposes beyond the intent of Congress.

LAC was developed for just that kind of ambiguity, which is inherent in the use/preservation mandate for wilderness management. An LAC process might be precisely the best method for determining acceptable impact levels for mining, logging, or grazing that preserve the recreation purposes of the National Recreation Area.

Another practical problem with widespread application of LAC is that it requires monitoring of a broader spectrum of indicators over a wider geographic area. In times of tight budgets, funds for such monitoring may be hard to come by. Moreover, it may be difficult to train personnel in the skills necessary to measure such a wide range of indicators. However, these are difficulties inherent in any adaptive management effort, including but not limited to LAC processes, and will plague ecosystem managers whether LAC is used or not.

What is "Acceptable"?

LAC entails a fundamental acknowledgment of the notion that, while anthropogenic change in wilderness is undesirable both philosophically and legally, it is also inevitable in light of the policy and management goal of providing human benefits through wilderness use. For that reason, LAC processes seek to define degrees of anthropogenic change that are "acceptable" if not desirable. Stankey and others (1985) focused on ways of achieving that goal without thoroughly examining what it means for a condition to be acceptable. When ecosystem management was similarly defined as a means for achieving "socially acceptable" conditions, Stankey and Clark (1992) argued it was time to explore what it means for a land condition or management practice to be socially acceptable.

In the limited context of wilderness, this may not be difficult because anthropogenic change is generally acknowledged to be undesirable except if intended to prevent greater human impacts (as when a boardwalk is built over a boggy trail section). An "acceptable" condition is one where there is minimal change attributable to recreation or other uses, and an appropriate management strategy is necessarily one that can control the amount of anthropogenic change. Differences of opinion among wilderness users are likely to focus on the *degree* of anthropogenic change that can be accepted, but not on the *direction* of change.

That is not necessarily the case outside wilderness and protected areas. In the broader context of ecosystem management, "social acceptability" can be defined as the result of "a judgmental process by which individuals (1) compare the perceived reality with its known alternatives and (2) decide whether the "real" condition is superior, or sufficiently similar, to the most favorable alternative condition" (Brunson 1996, p. 9). In wilderness there is always a known optimal condition: that which is believed to be "natural." Conditions that arise as a result of "natural causes" are virtually always acceptable and desirable. Conversely human acts are likely to be acceptable only if they are substantially unnoticeable.

In nonwilderness settings, natural causes may be acceptable *after the fact* as unavoidable "acts of God" that have no foreseeable alternative. However, they may not be seen as desirable; for example, a lightning-caused fire that destroys a valuable stand of timber or a Forest Service work station. In that case the desired condition may be an unburned forest, and strategies must be planned in advance to prevent discrepancies between that condition and reality. Moreover, some constituencies may believe that natural fire in timber stands is always acceptable while other constituencies disagree. Unlike in wilderness, constituencies may agree that natural is not always best.

Acceptability is a function not only of the desirability of a condition and its imaginable alternatives, but also of the equitability and feasibility of those alternatives (Brunson 1993). In the fire prevention example, loss of the timber stand or work station can be unacceptable only if the resulting condition is both undesirable and preventable. A further consideration is whether certain individuals will be hurt by decisions made one way or the other. Equity issues are likely to be more problematic in nonwilderness than in wilderness settings, simply because there are likely to be more interests seeking "their" share. While equity concerns do arise in wilderness planning—such as when deciding how to allocate resources to outfitted versus nonoutfitted use—they are much more difficult to address when the economic sustainability of local communities is a prime concern.

LAC Adaptations for Nonwilderness Planning

A key conceptual difference between wilderness and nonwilderness LAC is the way we conceptualize change. Desired future conditions in wilderness are defined theoretically and legally by our best understanding of the range of historic (presettlement) variation that we consider "natural." A principal goal of management is to slow or stop anthropogenic change—especially if it leads to conditions outside the range of historic variation. In nonwilderness landscapes, desired future conditions may or may not be defined by past conditions. While there is a tendency to use analyses of ecological history to define the sustainable limits of future conditions, change may be prescribed as a means to restore past conditions or to achieve a new kind of sustainable condition. The goal of management is to direct change, and that change might not only be "acceptable" but even preferable. Ironically, this may make standard-setting easier outside wilderness in some cases where the objective is not the undefinable and constantly shifting "natural" state.

For nonwilderness settings, we still seek a condition that falls within acceptable limits, but the acceptable range is likely to have two bounds rather than one. Too little change in conditions may be as unacceptable as too much change or a wrong kind of change. Accordingly, LAC standards often may be time-bounded, defined as rates of change in conditions toward a desired state, rather than as the existence or extent of unnatural conditions. Regular monitoring is especially important when determining whether change is proceeding at desired rates as well as in desired directions. Not only is it impossible to determine any rate without regular measurements, managers may not be certain whether the strategies used to produce change are likely to achieve the desired conditions.

As noted earlier, probably the greatest conceptual challenge inherent in adapting LAC to nonwilderness settings is

to accommodate a multiplicity of potentially conflicting goals. Cole and Stankey (this proceedings) point out that LAC standards describe a desired compromise between opposing goals. In so doing, managers or task force members first identify an "ultimately constraining goal" that holds a higher priority than its polar opposite. This is the goal we cannot allow to be compromised beyond a certain point, but it is also the goal that is compromised first. A standard defines how much constituents will allow that goal to be compromised. In wilderness, the ultimately constraining goal essentially is defined by law: maintenance of natural conditions. The compromise is allowed to achieve some degree of an opposing goal such as providing access to recreation or protecting adjacent nonwilderness resources against fire damage.

This same approach can be applied to multiple-use LAC processes, but standards must address each of the compromises that may have to occur between pairs of opposing goals. For example, if goals for a landscape include timber harvesting, forage production, off-road recreation, protecting wildlife diversity, and conserving rare plant species, care must be taken to ensure that standards are established that define the acceptable compromise between wildlife and timber, wildlife and livestock forage, wildlife and off-road vehicle use, wildlife and plants of particular interest, timber and forage, and so on.

Some of the hottest debates during a nonwilderness LAC process may hinge on deciding which goal in a pair is ultimately constraining. Is it more important in the landscape of interest to produce timber or scenery? Is the primary purpose of an area to maintain high-quality riparian vegetation or produce forage of livestock? In some cases it may be possible for LAC task groups to devise a process for ranking all goals, thereby establishing the higher priority goal within each pair. At other times, the task group will have to consider each pair separately. Either way, standards must be based on consideration of interactions within each pair of goals to ensure that the standards selected can address the kinds of impacts produced by activities occurring in pursuit of the lower priority goal.

Some assistance in the prioritization process will come, as in the case of wilderness, from legal or administrative precedents that predetermine goal priorities. For example, the Endangered Species Act (16 U.S.C. §1531-43) dictates that in any pair of goals involving protected plants or animals, the ultimately constraining goal must be to meet the habitat needs of that species. Yet the law and associated regulations also explicitly allow for compromise to exist. The negotiation of such compromises is the essence of the Habitat Conservation Plan process (Larmer 1997). Other legal direction for goal prioritization may be found in laws protecting cultural resources, creating special recreation designations such as a Wild and Scenic River, or preventing discrimination against disabled persons.

Similarly, administrative direction for choosing an ultimately constraining goal is provided in the rules for maintaining visual quality and making recreation opportunity spectrum (ROS) allocations, which essentially determine that extractive uses can occur within designated zones only if they do not exceed limits defined by ROS or visual guidelines.

Skeptics reading the last example may note that extractive activities have exceeded ROS and visual quality guidelines relatively often, and when discrepancies are called to an agency's attention the response often is to change the ROS or visual quality designation. This is likely to be an ongoing problem whenever there is no legal basis for determining priorities within goal pairs. It may be best if this problem is addressed explicitly during the stage of the process in which strategies are chosen for ameliorating violations of LAC standards.

Despite the greater conceptual complexity, there may be little procedural difference between wilderness and nonwilderness LAC processes. Any adaptive processes for planning and management entail several stages including issue identification, inventory of existing conditions, identification of standards necessary to maintain desired conditions, monitoring, and developing and (if necessary) implementing strategies for mitigating impacts that lead to unacceptable conditions. Each of these is included in one or more steps of the LAC process. However, some steps in a nonwilderness LAC process may require more time to complete because of the multiplicity of goals to be considered and the often-greater difficulty of reaching a consensus on what those goals should be.

For example, one might need a more comprehensive scoping process, involving a broader range of constituencies, to identify area concerns and issues in multiple-use landscapes. The range of opportunity classes or "prescriptive management zones" (Cole and McCool, this proceedings) is likely to be larger in nonwilderness LAC plans, although the landscapes appropriate to ecosystem management may be smaller than many wildernesses. Prescriptions may be expressed best in terms of combinations of allowable uses (such as motorized dispersed recreation plus grazing plus timber production in one zone, motorized recreation plus grazing without timber production in another), although other criteria may be developed through collaborative discussions. This process of reaching consensus on goals or desired conditions for each prescriptive management zone is the core effort of any strategic planning effort under ecosystem management, and must be conducted without the "safety net" of the Wilderness Act, which greatly restricts the range of potentially acceptable conditions.

Because there will be more goals in most multiple-use situations, attention must be paid to a broader range of potential conditions. Planning groups may select indicators of resource and social conditions that are not commonly used in LAC processes (such as rates of change in range condition trend or allowable animal unit months; habitat suitability index thresholds or rates of improvement in habitat effectiveness). Social indicators may include ones that describe conditions outside the landscape itself but in affected communities (such as teen unemployment rates; percentage of homes heating with fuelwood). For the most part, these are already in use—or being evaluated for use—in ecosystem management and should be entirely compatible with LAC.

Developing standards for those indicators should flow from the process of identifying desired conditions for each prescriptive management zone. Standards must be set that fit scientific or economic or social realities, are amenable to measurement under realistic monitoring conditions, and are believed to achieve the desired condition even if that entails change from existing conditions. It is likely that these will be identified by professionals within specific

professional disciplines after LAC work groups have defined the desired condition in more qualitative terms. Other steps—conducting baseline inventories, identifying and selecting management alternatives for ameliorating unacceptable impacts or rates of change, and monitoring—will be part of any ecosystem management process whether LAC is used or not.

In summary, the Limits of Acceptable Change approach to planning is one of several planning frameworks that can incorporate collaborative planning and methods of goal-setting and impact and standard comparison to manage adaptively to achieve ecologically and socially sustainable landscapes. While there will be conceptual adjustments necessary to apply LAC in ecosystem management situations—primarily in the ways we think about change and in the care that must be taken to examine impacts and priorities within pairs of opposing goals—these are not incompatible with the overall LAC approach. The advantage of using LAC is that we already have a substantial cadre of agency employees who are experienced with the method and may feel comfortable applying it to a wide range of landscapes.

References

Brunson, Mark W. 1993. "Socially acceptable" forestry: what does it imply for ecosystem management? Western Journal of Applied Forestry. 8(4): 116-119.

Brunson, Mark W. 1996. A definition of "social acceptability" in ecosystem management. In: Brunson, M.; Kruger, L.; Tyler, C.; Schroeder, S., eds. Defining social acceptability in ecosystem management: a workshop proceedings; Kelso, WA; 1992 June 23-25; Portland, OR: Pacific Northwest Research Station: 7-16.

Brunson, Mark W.; Richardson, Kimberly J. 1997. Perceived fairness and effectiveness of rangeland collaborative processes. Paper presented to the 50th annual meeting, Society for Range Management, Rapid City, SD, Feb. 17-20.

Brunson, Mark W.; Rodriguez, Don. 1992. Standards for managing nonwilderness recreation areas. In: Shelby, B.; Stankey, G.; Shindler, B., eds. Defining wilderness quality: the role of standards in wilderness management—a workshop proceedings; 1990 April 10-11. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 61-66.

Fitch, Linda L. 1993. Using the Limits of Acceptable Change (LAC) process as an effective planning tool for winter recreation. Final project paper, Professional Development for Outdoor Recreation Planners/Managers Shortcourse. Logan, UT: Utah State University.

Floyd, Donald W. 1993. Managing rangeland resources conflicts. Rangelands. 15(1): 27-30.

Germain, Rene H.; Donald W. Floyd. 1996. Environmental dispute resolution: when is voluntary negotiation an appropriate tool in resolving environmental conflict? Paper presented to the Sixth International Symposium on Society and Resource Management, University Park, PA, May 18-23, 1996.

Larmer, Paul. 1997. Habitat conservation plans: who wins and who loses when Uncle Sam cuts deals with landowners to protect endangered species? High Country News. 29(14): 1,10-11.

Lee, Kai. 1993. Compass and gyroscope: integrating science and politics for the environment. Washington, DC: Island Press. 243 p.

Manning, Robert E.; Lime, David W.; Hof, Marilyn. 1996. Social carrying capacity of natural areas: theory and application in the U.S. National Parks. Natural Areas Journal. 16(2): 118-127.

McCoy, K. Lynn; Krumpe, Edwin E.; Allen, Stewart. 1995. Limits of Acceptable Change planning—evaluating implementation by the U.S. Forest Service. International Journal of Wilderness. 1(2): 18-22.

Muckenfuss, E. 1994. Cooperative ecosystem management in the ACE Basin. Journal of Forestry. 92(8): 35-36.

Salwasser, Hal. 1994. Ecosystem management: can it sustain diversity and productivity? Journal of Forestry. 92(8): 6-10.

Stankey, George H.; Cole, David N.; Lucas, Robert C.; Petersen, Margaret E.; [and others]. 1985. The Limits of Acceptable Change (LAC) system for wilderness planning. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Stankey, George H.; Clark, Roger N. 1992. Social aspects of New Perspectives in Forestry: a problem analysis. Milford, PA: Grey Towers Press.

Swanson, Sherman. 1994. Viewpoint: integrating CRM and NEPA processes. Journal of Range Management. 47(2): 100-106.

Torrell, David J. 1993. Viewpoint: alternative dispute resolution in public land management. Journal of Range Management. 46(6): 70-73.

A Comparative Analysis of Protected Area Planning and Management Frameworks

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Abstract—A comparative analysis of the Recreation Opportunity Spectrum (ROS), Limits of Acceptable Change (LAC), a Process for Visitor Impact Management (VIM), Visitor Experience and Resource Protection (VERP), and the Management Process for Visitor Activities (known as VAMP) decision frameworks examines their origins; methodology; use of factors, indicators, and standards; appropriate application; and relationships. While many areas in the frameworks can be improved, the most pressing needs are integration of principles among the frameworks and with other planning processes that emphasize ecosystem-based management and an evaluation of their effectiveness, particularly with the profound organizational changes taking place in all protected area agencies.

Since the mid 1970's, a variety of planning and management frameworks have been developed for protected areas to address issues such as recreation carrying capacity; human use that causes stress for ecosystems; methods to determine appropriate types, levels, and conditions of use; and methods to inventory and manage an appropriate mix of visitor opportunities. These frameworks include the Recreation Opportunity Spectrum (ROS), the Limits of Acceptable Change (LAC) framework, the Process for Visitor Impact Management (VIM), the Visitor Experience and Resource Protection (VERP) framework, and the Management Process for Visitor Activities (known as VAMP). While each framework or "pre-formed decisionmaking structure" (Meis 1990) has a unique origin, these frameworks also share many similarities. Considerable effort has been devoted to describing what the individual frameworks seek to accomplish, the steps involved, and how they have been applied to individual sites.

Until recently, few comparative analyses have been undertaken for these contemporary frameworks. Recent examples include: a comparative analysis of the formula-based carrying capacity approaches, as well as of ROS and LAC (Graefe and others 1990); a comparative analysis of ROS, LAC, VIM, and VAMP (Payne and Graham 1993); two workshops on visitor management (Graham and Lawrence 1990; Rickson and others 1995); and studies on the use of these frameworks (Giongo and others 1993; Schneider and others 1993).

As part of a project to define a spectrum of appropriate National Park opportunities and in response to numerous staff inquiries about the various planning and management tools, a summary description of 11 approaches was prepared for Parks Canada (Tayler 1996). Five of these frameworks are described and compared here. After an extensive literature review, each of the five frameworks was described and analyzed in terms of origins; methodology; use of factors, indicators, and standards; appropriate applications; and relationships (see table 1). These variables were chosen to create a practical snapshot of the selected frameworks for Parks Canada field staff. Field staff could then decide which approach would be appropriate to address the issues they were dealing with. The comparative analysis then led to the identification of a number of common themes, issues, and recommendations for future research.

Results of the Comparative Analysis

Origins

The circumstances and the parties involved in developing each approach are unique and have been described in detail in the literature (Graham and Lawrence 1990; Rickson and others 1995). A comparison of their origins (Tayler 1996) revealed that each approach:

- Originated from a collaboration between researchers and Federal agency staff or between researchers and national nongovernmental organizations (VIM, for example, was developed in conjunction with the U.S. National Parks and Conservation Association).
- Benefited from advances in recreation research, particularly in the late 1970's with the work of Driver and Brown (1978), and Clark and Stankey (1979) on ROS, and in the mid-1980's with the development of LAC (Stankey and others 1985) and VAMP (Parks Canada 1985).
- Was a response to both legislative and policy requirements, as well as to increasing recreation demands, impacts, and conflicts.
- Recognizes the origins and deficiencies of the traditional carrying capacity model for recreation management and strives to move beyond it.

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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Table 1—Comparative Analysis of Planning and Management Framework.

Recreation Opportunity Spectrum (ROS)

Developed by researchers working for the U.S. Forest Service and Bureau of Land Management in response to concerns about growing recreational demands and increasing conflict over use of scarce resources, and a series of legislative directives that called for an integrated and comprehensive approach to natural resource planning. The process comprised six land classes to aid in understanding physical, biological, social and managerial relationships, and to set parameters and guidelines for management of recreation opportunities.

Steps of the Process

1. Inventory and map the three setting perspectives that affect the experience of the recreationalist, namely the physical, social and managerial components.
2. Complete analysis:
   a) identify setting inconsistencies;
   b) define recreation opportunity classes;
   c) integrate with forest management activities; and
   d) identify conflicts and recommend mitigation.
3. Schedule.
4. Design.
5. Execute projects.
6. Monitor.

The end product is a definition of the opportunity for experience expected in each setting (six classes—primitive to urban), the indicators of the experience, and the parameters and guidelines for management.

Factors, Indicators and Standards:

Seven **setting indicators** have been identified. They represent aspects of recreation settings that facilitate a range of experiences that can be influenced by managers.

1. Access
2. Remoteness
3. Visual Characteristics
4. Site Management
5. Visitor Management
6. Social Encounters
7. Visitor Impacts

Criteria have been developed by the U.S. Forest Service for each of the indicators and for each of the six land classes, e.g., distance guidelines, remoteness, user density in terms of capacity and frequency of contact, and degree of managerial regimentation required.

Applications Best Suited for

This process can be employed in almost all landscape planning exercises. However, the nature of the spectrum, the indicators and their criteria depend on the purpose of the area, the mandate of the organization and the responsibilities of management.

Relationships

This management matrix approach has been incorporated into the LAC system and can be used with VIM. It has been recognized within VAMP, but is hindered by the current use of zoning in Parks Canada.

Strengths: It is a practical process with principles that force managers to rationalize management from three perspectives:
- protection of the resource;
- opportunities for public use; and
- the organization's ability to meet preset conditions.

It links supply with demand and can be readily integrated with other processes. It ensures that a range of recreation opportunities are provided to the public.

Weaknesses: The recreation opportunity spectrum, its setting indicators and their criteria must be accepted in total by managers before any options or decisions can be made. Disagreement will affect the rest of the planning program. ROS maps need to be related to the physical and biophysical characteristics of each area.

Process for Visitor Impact Management (VIM)

Developed by researchers working for the U.S. National Parks and Conservation Association for use by the U.S. National Park Service. The process addresses three basic issues relating to impact: problem conditions; potential causal factors; and potential management strategies.

Steps of the Process

1. Conduct pre-assessment database review.
2. Review management objectives.
3. Select key indicators.
4. Select standards for key impact indicators.
5. Compare standards and existing conditions.
6. Identify probable causes of impacts.
7. Identify management strategies.
8. Implement.

Factors, Indicators and Standards

The list of possible **indicators of impact** includes:

Physical impacts:
- soil density, pH, compaction, drainage, chemistry, productivity
- amount and depth of litter and dust
- area of barren core and of bare ground
- area of complete campsites
- number and size of fire rings
- number of social trails
- visible erosion

Biological impacts:
- soil fauna and microfauna
- ground-cover density and loss of ground cover
- diversity and composition of plant species
- proportion of exotic plant species
- plant species height, vigour and diseases
- trees—mutilation, seeding regeneration, exposed roots
- wildlife species—diversity, abundance, sightings
- presence or absence of indicator species
- reproduction success

Social Impacts:
- number of encounters
  - by activity type with other individuals/day
  - by size of group
  - with other groups/day
  - by mode of transport
  - by location of encounter
- visitor perception of crowding
- visitor perception of impact on the environment
- visitor satisfaction
- visitor complaints
- visitor reports of undesirable behaviours

Standards are established for each indicator based on the management objectives that specify acceptable limits or appropriate levels for the impact.

Applications Best Suited for

This is a flexible process parallel to LAC that can be applied in a wide variety of settings. It employs a similar methodology to assess and identify existing impacts and particularly the causes.

Relationships

Like LAC, this process has been incorporated into the VERP system.

Strengths: Process provides for a balanced use of scientific and judgemental considerations. It places heavy emphasis on understanding causal factors to identify management strategies. The process also provides a classification of management strategies and a matrix for evaluating them.

Weaknesses: The process does not make use of ROS, although it could. It is written to address current conditions of impact, rather than to assess potential impacts.

(con.)

Table 1 (Con.)

Limits of Acceptable Change (LAC)

Developed by researchers working for the U.S. Forest Service in response to concerns about the management of recreation impacts. The process identifies appropriate and acceptable resource and social conditions and the actions needed to protect or achieve those conditions.

Steps of the Process

A nine-step process, normally illustrated as a circle of steps:

1. Identify area concerns and issues.
2. Define and describe opportunity classes (based on the concept of ROS).
3. Select indicators of resource and social conditions.
4. Inventory existing resource and social conditions.
5. Specify standards for resource and social indicators for each opportunity class.
6. Identify alternative opportunity class allocations.
7. Identify management actions for each alternative.
8. Evaluate and select preferred alternatives.
9. Implement actions and monitor conditions.

Factors, Indicators and Standards

Factors will depend on issues identified in Step 1 above. Examples:

Resource:

- trail conditions
- campsite conditions
- water quality
- air quality
- wildlife populations
- range condition
- threatened/endangered species

Social:

- solitude while travelling
- campsite solitude
- conflicts between visitors
- conflicting travel methods
- conflicts with party size
- noise

Examples of indicators and standards are in the literature. Standards are the measurable aspects of the indicators and are the basis for judging whether a condition is acceptable or not. Standards describe acceptable and appropriate conditions for each indicator in each opportunity class.

Applications Best Suited for

The process is a good vehicle for deciding the most appropriate and acceptable resource and social conditions in wilderness areas. It has been applied to wild and scenic rivers, historic sites and tourism development areas.

Relationships

The process incorporates opportunity classes based on concepts of ROS and a means of analysis and synthesis. It is built into the U.S. National Park Service VERP framework.

Strengths: The final product is a strategic and tactical plan for the area based on defined limits of acceptable change for each opportunity class, with indicators of change that can be used to monitor ecological and social conditions.

Weaknesses: The process focuses on issues and concerns that guide subsequent data collection and analysis. Strategic and tactical direction may not be provided on management topics where there are no current issues or concerns.

Visitor Experience Resource Protection (VERP)

Created by the U.S. National Park Service. It is a new framework dealing with carrying capacity in terms of the quality of the resources and the quality of the visitor experience. It contains a prescription for desired future resource and social conditions, defining what levels of use are appropriate, where, when and why.

Steps of the Process

1. Assemble an interdisciplinary project team.
2. Develop a public involvement strategy.
3. Develop statements of park purpose, significance and primary interpretive themes; identify planning mandates and constraints.
4. Analyse park resources and existing visitor use.
5. Describe a potential range of visitor experiences and resource conditions (potential prescriptive zones).
6. Allocate the potential zones to specific locations within the park (prescriptive management zoning).
7. Select indicators and specify standards for each zone; develop a monitoring plan.
8. Monitor resource and social indicators.
9. Take management actions.

Factors, Indicators and Standards

The following **factors** are considered in the planning process:

- park purpose statements
- statements of park significance
- primary interpretation themes
- resource values, constraints and sensitivities
- visitor experience opportunities
- resource attributes for visitor use
- management zones

Resource and social indicators, as well as associated standards, were developed for each zone at Arches National Park, where the process was first tested.

Applications Best Suited for

The VERP framework was conceived and designed to be part of the U.S. National Park Service's general management planning process. This analytical, iterative process attempts to bring both management planning and operational planning together as one exercise. The emphasis is on strategic decisions pertaining to carrying capacity based on quality resource values and quality visitor experiences. The product is a series of prescriptive management zones defining desired future conditions with indicators and standards.

Relationships

This framework refers specifically to both LAC and VIM. No mention is made of ROS or VAMP. VERP parallels the basic processes of VAMP and ROS, and is seen as a component of LAC.

Strengths: Like VAMP, VERP is a thought process that draws on the talents of a team and is guided by policy and the park purpose statement. It guides resource analysis through the use of statements of significance and sensitivity, and visitor opportunity analysis is guided by statements defining important elements of the visitor experience. Zoning is the focus for management.

Weaknesses: Additional work is required to pilot the approach in different environments. "Experience" is not defined and the indicators for it are absent beyond the examples for Arches National Park. The will and ability to monitor sufficiently to provide information to guide management actions must also be tested.

(con.)

Table 1 (Con.)

Management Process for Visitor Activities (VAMP)

Created by Parks Canada as a companion process to the Natural Resources Management Process within the Parks Canada Management Planning System. The process provides guidance for planning and management of new parks, developing parks and established parks.

Steps of the Process

The process uses a model based on a hierarchy of decisions within the management program. Management plan decisions relate to the selection and creation of opportunities for visitors to experience the park's heritage settings through appropriate educational and recreational activities. Decisions about managing and delivering support services for each activity are reflected in the service plan. The basic principles of VAMP are within three Parks Canada documents:

- *Guiding Principles and Operational Policies*;
- *Management Planning Manual*; and
- *Visitor Activity Concept Manual*.

General steps of the management plan process are:

1. Produce a project terms of reference.
2. Confirm existing park purpose and objectives statements.
3. Organize a database describing park ecosystems and settings, potential visitor educational and recreational opportunities, existing visitor activities and services, and the regional context.
4. Analyse the existing situation to identify heritage themes, resource capability and suitability, appropriate visitor activities, the park's role in the region and the role of the private sector.
5. Produce alternative visitor activity concepts for these settings, experiences to be supported, visitor market segments, levels of service guidelines, and roles of the region and the private sector.
6. Create a park management plan, including the park's purpose and role, management objectives and guidelines, regional relationships, and the role of the private sector.
7. Implementation—set priorities for park conservation and park service planning.

Factors, Indicators and Standards

Factors that are considered in developing indicators and standards include:

- visitor activity profiles
  - kind
  - quantity, diversity, location
  - experiences/benefits sought
  - support services and facilities required at all stages of trip cycle
- stakeholder profiles
- interpretation theme presentation
- resource values, constraints and sensitivities
- existing legislation, policy, management direction, plans
- current offer of services and facilities at all stages of trip cycle
- regional activity/service offer
- satisfaction with service offer

Applications Best Suited for

The detailed process is specific to the planning program of Parks Canada and is parallelled by the Natural Resources Management Process. The basic VAMP concept incorporates the principles of ROS. The framework will benefit from and can easily incorporate the principles of VIM, LAC and VERP. The focus is assessment of opportunity, while the more precise impact question is left to the Natural Resources Management Process.

Relationships

The overall process provides a comprehensive framework for the creation and management of opportunities for visitors within the Parks Canada Management Planning Program.

Strengths: Comprehensive decision-making process based on a hierarchy. It benefits from the structured thinking required to analyse both opportunity and impact. It combines social science principles with those of marketing to focus on visitor opportunities.

Weaknesses: Although well-developed at the service planning level, VAMP does not yet have the clout it should have at the management planning level, mainly because the "opportunities for experience" definition has not been built into management plans or into the zoning.

Steps of the Process

All of the frameworks follow the steps of standard rational planning: terms of reference, database development, situation analysis, synthesis, objectives, alternatives, final plan, and implementation. Each approach, therefore, recognizes, in varying degrees, a hierarchy of decisions that need to be made, ranging from inventory and analysis to development of a management concept (strategic decisions), and, subsequently, implementation and operations (tactical decisions).

ROS, VIM, and VAMP are rational-comprehensive planning approaches (Payne and Graham 1993). The recently developed VERP (Hof 1993) can be added to this list. LAC was originally developed as a rational-comprehensive or synoptic planning process, but has been applied using the theory of transactive planning to produce plans for areas such as the Bob Marshall Wilderness Complex (McCool 1990).

Factors, Indicators, and Standards

Stankey and McCool (1990) make a distinction between factors, indicators, and standards. Factors are "broad categories of issues or concerns" (such as trail conditions), from which one or more indicators can be identified that reflect the overall condition of the factor. "Indicators are specific variables" (such as soil compaction) "that singly, or in combination, are taken as indicative of the conditions of the overall opportunity class" or "factor." "Standards are measurable aspects of indicators" that "provide a base against which a particular condition can be judged as acceptable or not" (Stankey and McCool 1990: 225-26).

The five approaches vary considerably in the language they use and the degree of emphasis they place on factors, indicators, and standards. These differences reflect variations in the questions being asked, the type of research and analysis that follows, and the decisions that are being made. VAMP and VERP share the greatest similarities, with their emphasis on a broad range of factors at the strategic level of planning and management. With these strategic decisions in place, there is a basis for developing indicators and standards. Each approach addresses the issue of indicators and standards differently. In VERP, both resource and social indicators are described; however, all the social indicators relate to levels of crowding (USDI 1995). VAMP emphasizes social indicators and standards (levels of service) from a visitor's perspective and is complemented by a natural resource management and an environmental impact assessment process that address resource factors, indicators, and standards. The results of applying these processes are integrated during management planning.

LAC and VIM identify issues and concerns (factors) at the outset of the process, then define management objectives. The issues and management objectives guide the selection of indicators and standards. This issue-driven approach leads to a narrow range of factors being considered and more emphasis on choosing appropriate indicators and standards, followed by monitoring. Graefe and others (1990: 232) note that "VIM includes an explicit step aimed at identifying probable causes of impact conditions, while LAC places greater emphasis on defining opportunity classes and developing alternative class allocations."

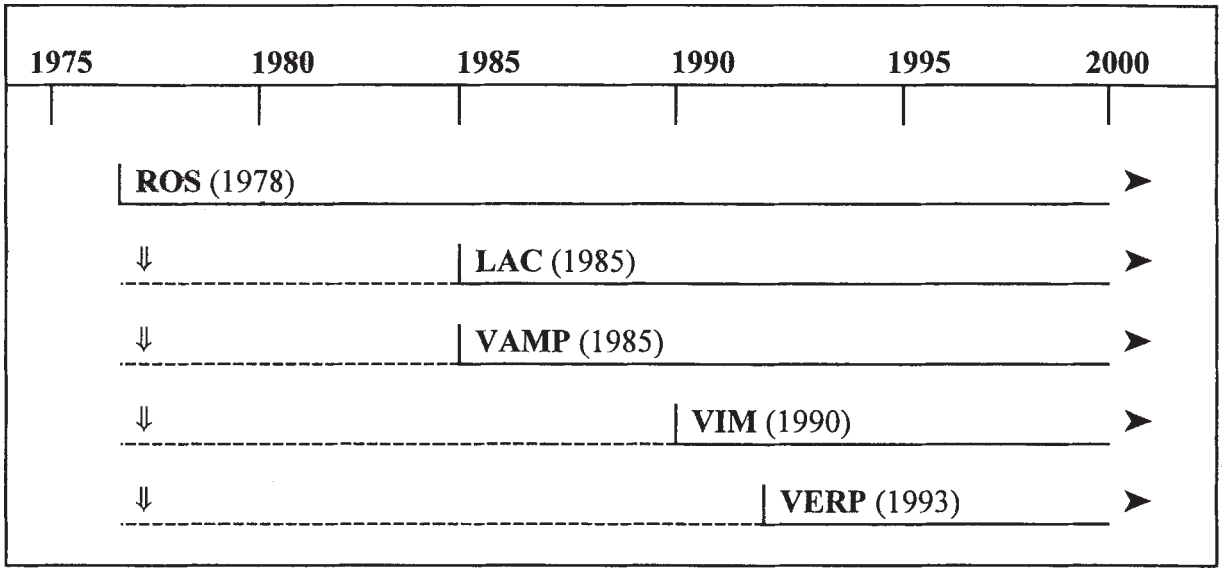

Figure 1—Evolution of the frameworks.

ROS seems to fall between the two subgroups. ROS does consider physical (resource), social, and managerial factors that contribute to strategic decisions about the supply of recreation opportunities; however, indicators are used differently than in the other frameworks. ROS has seven groups of setting indicators and standards that inventory the supply and demand of recreation opportunities, assist in monitoring over time, identify impacts, and determine the effectiveness of management actions (USDA 1981, 1990). Once the ROS class designations are agreed on during the planning process, they can be used to guide tactical decisions related to day-to-day operations.

Appropriate Applications

The appropriate application of each framework depends on which questions are being asked, and in which contexts or settings. ROS, VERP, and VAMP are more comprehensive and holistic. They are particularly useful for establishing a broad direction for the management of human use in protected areas. VIM and LAC are primarily issue-driven and narrower in focus. ROS, VERP, and VAMP also address the issue of interpreting natural and cultural resources directly, whereas LAC and VIM require a conscious managerial decision to consider interpretation (Pugh 1990).

ROS is for macro or regional planning in a variety of different settings (Driver 1990). It is designed to integrate information about the supply and demand for outdoor recreation opportunities into other forms of planning (such as land and resource planning in the U.S. Forest Service). ROS can also be used to estimate the effects of management decisions on the provision of recreation opportunities. Its underlying concepts and principles can be applied to almost all landscape planning exercises.

VIM is reactive and best suited to more site-specific problems. It was derived from an extensive review of the recreation carrying capacity literature (Kuss and others 1990). For the impact of recreation on the environment and the quality of the visitor experience, VIM addresses three basic issues: problem conditions, potential causal factors, and potential management strategies. VIM emphasizes identifying probable causes of impact conditions given the scientific evidence that exists to date about the nature of recreation impacts.

LAC is "an extension of the ROS concept applied specifically to wilderness area management," but "could be applied to any natural areas used for recreation purposes" (Graefe and others 1990: 93). The "LAC concept provides a framework within which the appropriate amount and extent of change can be identified. It also can alert managers to the need for action when changes exceed standards" (Stankey and McCool 1990: 220). LAC is a good vehicle for addressing specific factors in a transactive planning approach, to define the limits of acceptable change. It relies on the use of indicators, standards, and monitoring to identify unacceptable impacts.

VERP builds on the experience of VAMP and the other previously mentioned frameworks, and to date has been applied to some U.S. National Parks. It was first applied at Arches National Park in response to the General Management Plan (USDI 1989), "to help National Park planners and managers address visitor carrying capacity and make sound decisions about visitor use" (USDI 1995: 3).

Although VAMP is designed to complement Parks Canada's existing planning frameworks, its associated principles can be readily applied in a variety of management contexts, from large protected areas to specific facilities. It combines a marketing approach to management of public opportunities with the constraints of managing heritage resources, focusing on the visitor requirements for enjoyable experiences through appropriate activities. VAMP is particularly useful for making strategic and operational decisions about target markets, market position, appropriate educational and recreation activities in selected heritage settings, and the kind, quantity, and quality of supporting services and facilities (Parks Canada 1985, 1988, 1991).

Relationships

Each framework builds successively on the experiences of the development and application of previous approaches. For example, elements of ROS have been built into each of the succeeding approaches (fig. 1). LAC calls for the identification of opportunity classes, whereas VAMP and VERP use management zones that are unique to each National Park. Since VIM was developed as a result of a comprehensive literature review in the late 1980's, it incorporates elements of ROS, LAC, and VAMP as they existed at that time (Kuss and others 1990).

VERP refers specifically to LAC and VIM, incorporating many of the same elements and techniques. Its comprehensive, strategic nature and recognition that the "Park Service should manage visitor use continuously, the same way it manages resources" (USDI 1995: 54) mirrors the basic concepts of VAMP. VAMP, however, places more emphasis on the factors that lead to a successful National Park experience through the selection of appropriate visitor activities, the conditions under which they are offered, profiles of visitor markets, and the kind, quality, and quantity of services and facilities.

VAMP draws heavily on the principles of ROS and the associated recreation production process model. The basic VAMP concept is based on the four levels of demand in the ROS model, namely demand for activities, setting attributes, experience opportunities, and benefits (Driver and Brown 1978). VAMP also draws from and easily incorporates many of the principles of VIM, LAC, and VERP.

Common Themes

All the approaches include:

- Interdisciplinary planning teams
- A focus on management of human-induced change
- A need for sound natural science and social science information
- Formal and informal data gathered over time
- The establishment of clear, measurable management objectives
- The definition of recreation opportunity settings as a "combination of biological, social and managerial conditions that give value to a place" (Clark and Stankey 1990: 127)
- The hierarchy of demand and the link between activities, settings, experiences, and benefits (Driver and Brown 1978)
- Recognition that "there is no single, predictable environmental or behavioural response to recreation use" (Graefe 1990: 214)
- Recognition that "most impacts *do not* exhibit a direct linear relationship with user density," and a variety of situational factors must be considered (Graefe 1990: 214)
- Recognition that it is important to provide a diversity of recreation and educational opportunities
- A focus on elements of the recreation setting, because these are the components of the recreation opportunity that managers can readily influence
- A range of direct and indirect management strategies (Graefe and others 1990), in particular, zoning or landscape classification along a spectrum
- Ongoing monitoring and evaluation

Reference to the indicators (particularly resource indicators) and standards in LAC, VERP, and VIM have made these approaches appealing to recreation planners and managers using a scientific natural resource management perspective. The use of indicators and standards also makes these approaches attractive to those interested in ecosystem-based management and monitoring. The emphasis on monitoring helps managers understand the consequences of recreation use and impact. However, in the future, more emphasis on understanding the probable causes of impacts (such as Step 6 of VIM) is needed, rather than just the impacts themselves, if the source of the impacts is to be influenced.

VIM is the only approach analyzed that specifically emphasizes understanding the probable causes of visitor impact. It also suggests a range of management strategies, and includes a framework for evaluating alternatives.

Finally, all of the approaches recognize that "effective management involves both scientific and judgemental considerations…and [effective management] is more than carrying capacity and use limits" (Graefe 1990: 216).

Issues and Recommendations

Lack of Integration

While some integration among the frameworks has occurred, there is considerable room for improvement. Each framework could benefit from a thorough review and integration of the key principles of the other frameworks and the lessons learned through application, where appropriate. The LAC Workshop (this proceedings) in Missoula, MT (May 1997), represents an important first step in this direction. Similarly, additional research is necessary on the degree of success that has been experienced in the integration of these frameworks with other planning and management frameworks and concepts. A particular gap to be addressed is the integration of these frameworks with planning exercises that emphasize ecosystem-based management.

Matching Frameworks to Problems

Managers and planners continue to struggle to identify which planning frameworks and associated research tools and techniques should be used to address specific problems. The first step is to decide which questions they are trying to answer, since each framework tries to answer different types of questions.

To balance the complex issues of outdoor recreation management with the reality of dwindling financial and human resources, managers and planners must look to fields such as risk management for techniques to help prioritize which problems should be addressed and on what scale. For example, Cole and Landres suggest considering criteria such as "the intensity, longevity and areal extent of impacts

as determined by threat characteristics (intensity, areal extent, frequency, timing, predictability and others) and the vulnerability (resistance, resilience) of the affected attribute" (1996: 170), when evaluating the significance of an impact.

Emphasis on Indicators and Standards

LAC, VERP, and VIM place considerable emphasis on identifying factors, indicators, and standards, and on subsequent monitoring. Such a threat-specific approach provides a mechanism for detecting early signals of problems, but does not necessarily pinpoint the root causes of the problems. Like a doctor working on a patient with multiple wounds, the current approaches emphasize understanding the size, shape, and significance of each wound, without understanding the cause, alternative ways of healing the injury, or ways to prevent it from recurring. Likewise, the key indicators of the health of the whole patient (in this case, the ecosystem) may be not be monitored along with the site-specific problems.

Additional research is required to understand the relationship between factors, indicators, and standards. Graefe and others (1990) suggest that additional work is also required to understand the probable causes of impacts and how these causes can be influenced. Similarly, the "integrated monitoring" of a wide range of key ecosystem indicators at the appropriate level is required in conjunction with threat-specific monitoring to ensure that the health of the overall ecosystem is considered as part of the planning exercise (Woodley 1996).

Data and Information Requirements

The frameworks' varying degrees of emphasis on factors, indicators, and standards, combined with a lack of questions about the appropriate scope and scale of analysis, create a confusing picture of which approaches should be used for what purpose. This diversity of emphasis directly influences decisions about what type of data collection, analysis, and information is required. Inappropriate data may be collected if strategic questions and a hierarchy of decisions were not considered at the outset. There is a continued need for better-defined baseline data and information needs at the appropriate levels of management; more timely information, provided at the right point in the decisionmaking process; and an understanding of the authority and limitations of available data (Machlis 1993, 1996).

Definitions and Descriptions

Each of the frameworks calls for the definition and description of opportunity objectives, classes, or zones. These are determined through an analysis of resources, social and managerial conditions, and the availability, capability, feasibility and suitability of settings for outdoor recreation. While each framework uses similar principles and concepts, the language used to describe them is often imprecise and vague. Additional work is required to articulate the attributes that define opportunity objectives, classes, or zones. This effort would establish a common vocabulary, as well as agreed-on standards, that can be more readily monitored, managed, and maintained.

Changing Environments, Organizations, and Staff Capabilities

The reinvention of government in the early 1990's, combined with fiscal restraint, brought considerable changes to organizational structures, priorities, and the availability of financial and human resources in all protected area agencies. Staff capabilities and training are eroding or disappearing, yet the mandates for protection or multiple use, and the provision of education and recreation opportunities remain. Lack of training, knowledge, and the time needed to understand different approaches have led to misapplications of some of the frameworks. Elsewhere, staff are reinventing approaches to visitor management based on their limited understanding of previous research, thereby wasting scarce human and financial resources. In parks, protected areas, and educational institutions, there is a need to understand the basics of each planning and management framework as summarized in table 1.

Alternative Management Strategies

Each of the planning and management frameworks requires an array of direct and indirect management strategies. VIM goes a step further and suggests a matrix to evaluate these strategies. Little research, however, has been completed to determine the effectiveness of any of these strategies. This problem is further described by McCool and Christensen (1996), who confirm that there is plenty of experience in applying these strategies but that knowledge about their effectiveness is largely anecdotal. "This experience is invaluable and should be documented, synthesized and archived" (McCool and Christensen 1996: 81). Furthermore, there is little documentation of the costs of alternative strategies or public preferences for direct versus indirect approaches in front-country and urban environments. The U.S. Forest Service report entitled "Managing Wilderness Recreation Use: Common Problems and Potential Solutions" (Cole and others 1987) is a notable exception.

In addition to evaluating the effectiveness of the management strategies recommended by the various planning frameworks, Schneider and others (1993: 1) note that "although researchers have devoted great effort to developing recreation management innovations, there have been few evaluations of these innovations or studies of their diffusion and implementation." Some progress has been made through workshops at Waterloo in 1989 (Graham and Lawrence 1990) and Wisconsin in 1992 (Rickson and others 1995), and through other studies (Giongo and others 1993; Schneider and others 1993). Managers and practitioners, however, would benefit from further evaluations of implementation of the frameworks, and, more important, their effectiveness in maintaining the integrity of ecosystems while providing opportunities for education and outdoor recreation in protected areas.

References

Clark, R. N.; Stankey, G. 1979. The recreation opportunity spectrum: a framework for planning, management and research. Gen. Tech. Rep. GTR-PNW-98. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest Experiment Station. 32 p.

Clark, R. N.; Stankey, S. 1990. The recreation opportunity spectrum: a framework for planning, management and research. In: Graham, R.; Lawrence, R., eds. Towards serving visitors and managing our resources—proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo: 127-156.

Cole, David N.; Landres, Peter B. 1996. Threats to wilderness ecosystems: impacts and research needs. Ecological Applications. 6(1): 168-184.

Cole, David N.; Petersen, M. E.; Lucas, Robert C. 1987. Managing Wilderness Recreation Use: Common Problems and Potential Solutions. Gen. Tech. Rep. INT-230. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 60 p.

Driver, B. 1990. Recreation opportunity spectrum: basic concepts and use in land management planning. In: Graham, R.; Lawrence, R., eds. Towards serving visitors and managing our resources—proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo: 159-183.

Driver, B.; Brown, P. 1978. The opportunity spectrum and behavioural information in outdoor recreation resource supply inventories: a rationale. In: Gyde, H. Lund and others, tech. coords. Integrated inventories and renewable natural resources: proceedings of the workshop. Gen. Tech. Rep. RM-55. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 24-31.

Giongo, Francesca; Bosco-Nizeye, J.; Wallace, G. N. 1993. A study of visitor management in the world's national parks and protected areas. Fort Collins, CO: Colorado State University, College of Natural Resources. 138 p.

Graefe, A. 1990. Visitor impact management. In: Graham, R.; Lawrence, R., eds. Towards serving visitors and managing our resources—proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo: 213-234.

Graefe, A.; Kuss, F. R.; Vaske, J. J. 1990. Visitor impact management: the planning framework. Washington, DC: National Parks and Conservation Association. 105 p.

Graham, R.; Lawrence, R., eds. 1990. Towards serving visitors and managing our resources—proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo. 520 p.

Hof, M. 1993. VERP: A process for addressing visitor carrying capacity in the national park system (working draft). Denver, CO: National Park Service, Denver Service Center.

Kuss, F. R.; Graefe, A. R.; Vaske, J. J. 1990. Visitor impact management: a review of research. Washington, DC: National Parks and Conservation Association. 256 p.

Machlis, G. 1993. Social science and protected area management: the principles of partnership. The George Wright FORUM. 10(1): 9-20.

Machlis, G. 1996. Usable knowledge: a plan for furthering social science and the national parks. Washington, DC: National Park Service. 72 p.

McCool, Stephen F. 1990. Limits of acceptable change: evolution and future. In: Graham, R.; Lawrence, R., eds. Towards serving visitors and managing our resources—proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo: 186-193.

McCool, Stephen F.; Christensen, N. A. 1996. Alleviating congestion in parks and recreation areas through direct management of visitor behavior. In: Lime, David W., ed. Congestion and crowding in the National Park System. St. Paul, MN: Minnesota Agricultural Experiment Station: 67-83.

Meis, S. 1990. Visitor management issues: monitoring and evaluation. In: Graham, R.; Lawrence, R., eds. Towards serving visitors and managing our resources—proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo: 337-347.

Parks Canada. 1985. Management process for visitor activities. Ottawa, ON: National Parks Directorate, Visitor Activities Branch. 76 p.

Parks Canada. 1988. Getting started: a guide to park service planning. Ottawa, ON: Parks Canada, National Parks Directorate, Visitor Activities Branch. 128 p.

Parks Canada. 1991. Visitor activity concept. Ottawa, ON: Parks Canada, Program Headquarters, VAMP Technical Group. 16 p.

Payne, R. J.; Graham, R. 1993. Visitor planning and management in parks and protected areas. In: Deardon, P.; Rollins, R., eds. Parks and protected areas in Canada: planning and management. Toronto, ON: Oxford University Press: 185-210.

Pugh, D. 1990. Decision frameworks and interpretation. In: Graham, R.; Lawrence, R., eds. Towards serving visitors and managing our resources—proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo: 355-356.

Rickson, R. E.; Field, D. R.; Nilsen, P., eds. 1995. For the record: presentations at the second Canada/U.S. workshop on visitor management in parks forests and protected areas. Madison, WI: University of Wisconsin - Madison. 259 p.

Schneider, Ingrid; Anderson, Dorothy; Jakes, Pamela. 1993. Innovations in recreation management: importance, diffusion, and implementation. St. Paul, MN: U.S. Department of Agriculture. 12 p.

Stankey, G.; Cole, David N.; Lucas, Robert C.; Peterson, Margaret E.; Frissell, Sidney S. 1985. The Limits of Acceptable Change (LAC) system of wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Stankey, G.; McCool, S. 1990. Managing for appropriate wilderness conditions: the carrying capacity issue. In: Hendee, J. C.; Stankey, G. H.; Lucas, R. C. Wilderness Management (2d ed.) Golden, CO: Fulcrum Press: 215-239.

Tayler, G. 1996. Spectrum of national park opportunities. Unpublished report prepared for the Parks Canada, National Parks, Natural Resources Branch. 20 p.

U.S. Department of Agriculture, Forest Service. 1981. ROS user's guide. Washington, DC: U.S. Department of Agriculture, Forest Service. 37 p.

U.S. Department of Agriculture, Forest Service. 1990. ROS primer and field guide. U.S. Government Printing Office. 794-499. 10 p.

U.S. Department of the Interior, National Park Service. 1989. General management plan, development concept plan, environmental assessment: Arches National Park. Moab, UT: National Park Service.

U.S. Department of the Interior, National Park Service. Denver Service Centre. 1995. Visitor experience and resource protection implementation plan: Arches Utah National Park. Denver, CO: National Park Service, Denver Service Centre. 72 p.

Woodley, S. 1996. A scheme for ecological monitoring in national parks and protected areas. Environments. 23(3): 50-74.

Other Works Consulted

Cole, David N; McCool, Stephen F. 1997. Limits of acceptable change and related planning frameworks: critical issues. Background paper for the limits of acceptable change workshop. Missoula, MT: May 20-22. 23 p.

Driver, B. 1970. Elements of outdoor recreation planning. Ann Arbor, MI: University of Michigan Press. 316 p.

Graefe, A.; Vaske, J. J.; Kuss, F. R. 1984. Social carrying capacity: an integration and synthesis of twenty years of research. Leisure Sciences. 6(4): 395-431.

Graham, R. 1990. Visitor activity management and Canada's national parks. In: Graham, R.; Lawrence, R., eds. Towards serving visitors and managing our resources—proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo: 271-296.

Lime, David W., ed. 1996. Congestion and crowding in the national park system. St. Paul, MN: Minnesota Agricultural Experiment Station. 144 p.

Manfredo, Michael J., ed. 1992. Influencing human behaviour: theory and applications in recreation, tourism and natural resources management. Champaign, IL: Sagamore Publishing Co., Inc. 371 p.

Manning, R. E. 1986. Studies in outdoor recreation. Corvallis, OR: Oregon State University Press. 166 p.

Manning, R. E.; Lime, D.; McMongale, R. 1994. Indicators of the quality of the visitor experience at a heavily used National Park. Fifth international symposium on society and resource management; 1996 June 7-10. Fort Collins, CO: Colorado State University, College of Natural Resources: 214-215.

Manning, R. E.; Lime, D.; Hof, M.; Friemund, W. 1995. The carrying capacity of national parks: theory and application. In: Payne, R.; Nilsen, Per. 1995. Innovations and challenges in the management of visitor opportunities in parks and protected areas. Occasional paper #26. Waterloo, ON: University of Waterloo, Heritage Resources Centre: 9-21.

McCool, Stephen F. 1990. Limits of acceptable change: some principles. In: Graham, R.; Lawrence, R., eds. Towards serving visitors and managing our resources—proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo: 194-200.

McCoy, K. Lynn; Krumpe, Edwin E.; Stewart Allen. 1995. Limits of acceptable change planning. International Journal of Wilderness. 1(2): 18-22.

Parks Canada. 1994. Guiding principles and operating policies. Ottawa, ON: Parks Canada, Department of Canadian Heritage. 125 p.

Parks Canada. 1993. Status report on the contribution of the implementation of VAMP to the achievement of Parks Canada's mandate. Ottawa, ON: National Parks, Visitor Activities Branch. 52 p.

Payne, R. J.; Nilsen, Per. 1995. Innovations and challenges in the management of visitor opportunities in parks and protected areas. Occasional paper #26. Waterloo, ON: University of Waterloo, Heritage Resources Centre. 84 p.

Synthesis Papers

The Limits of Acceptable Change Process: Modifications and Clarifications

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Abstract—There are ways to improve the LAC process and its implementational procedures. One significant procedural modification is the addition of a new step. This step—which becomes the first step in the process—involves more explicitly defining goals and desired conditions. For other steps in the process, clarifications of concept and terminology are advanced, as are numerous suggestions about how to implement LAC more effectively.

Major objectives of the Limits of Acceptable Change workshop (from which this proceedings resulted) were to identify procedural modifications, if needed, to clarify LAC terminology and concepts, and to make recommendations about implementational details. These objectives were largely met. During the workshop, weaknesses, problems, and contentious or confusing issues emerged. For the most critical of these issues, we debated potential clarifications of concept and terminology and means of correcting problems. In the end, one significant procedural modification—the addition of a step—was recommended. A number of clarifications and implementational recommendations were also advanced.

This paper describes the recommended procedural change, including the rationale for the change and the likely outcomes of the modified procedure. For each of the other steps in the LAC process, issues that lack clarity, are contentious, or tend to impede LAC applications are identified. The nature of each of these issues is stated, along with the problem that exists, if any. Each discussion of issues concludes with a recommended clarification of concept or terminology, advice about implementational details, or a call for further work. The recommended procedural modification and clarifications should help practitioners implement LAC more efficiently and effectively, as well as better understand the process and its underlying rationale.

Proposed Modification to the LAC Process

As originally formulated (Stankey and others 1985), the LAC process is driven by issues more than by goals (Nilsen and Tayler, this proceedings). The first step in the traditional LAC process is to identify issues and concerns. The specification of broad management goals and the articulation of desired future conditions are not explicitly called for within the LAC process. The lack of attention to goals and desired conditions was more an oversight than an intentional procedural specification. For the issue of wilderness recreation carrying capacity, goals and desired conditions were so self-evident that there seemed little reason to explicitly articulate them (Cole and Stankey, this proceedings). The importance of planning being goal-driven rather than issue-driven was recognized as National Park Service planners developed the Visitor Experience and Resource Protection (VERP) process. Hof and Lime (this proceedings) note that issues are obstacles that lie between existing conditions and desired conditions; therefore, issues cannot be dealt with unless desired conditions are specified.

Proposed Change

The proposed solution to this oversight is simply to add a new first step to the LAC process—a step that involves defining goals and desired conditions. The addition of this step makes the LAC process more similar to VERP in the details of implementation. In VERP, this step is described as "Develop statements of park purpose, significance, and primary interpretive themes; identify planning constraints." A shorter descriptor might simply be "Define goals." This step involves assembling the legal and policy mandates that will guide management of the area and developing a perspective on the significance of the area, its uniqueness, and its regional or national "niche." These can then be used to describe general goals for the area.

In wilderness, broad goals would stress preserving natural conditions, maintaining outstanding opportunities for solitude, and avoiding restrictions on recreational access and freedom of behavior. Specific goals would vary more from area to area. In a large, remote wilderness, goals might be developed that stress protecting unique wildlife populations and opportunities to experience challenge and the sense of remoteness. In a small wilderness close to a large urban area, goals might be developed that emphasize opportunities to provide access to urban populations or the importance of preserving a rare plant population. These goals constitute the statements of desired conditions that are largely absent from the original description of the LAC process.

The second step involves the identification of issues, concerns, and threats. These constitute existing or potential barriers to achieving the goals identified in the first step. To do this, it will be necessary to analyze and describe the

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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current situation. At this step in the process, it should be possible to assess whether or not some goals directly conflict with others. If they do conflict, it will not be possible to optimize all goals. If management is interested in compromising between goals, the LAC framework provides a rational, explicit means of compromising (Cole and Stankey, this proceedings). For example, the goals of preserving natural conditions and of providing solitude opportunities generally do not conflict with each other. However, both of these goals are frequently in conflict with the goal of not restricting access to wilderness recreation, and all of these goals are subject to compromise. The concern, addressed by the original LAC formulation, is how to define a compromise between resource and experiential conditions on one side of the equation and recreational access on the other side.

Many of the goals identified in the first step may either not conflict or may not be subject to compromise. These goals should be identified and need to be dealt with somewhere in the planning process. However, because there is no need for compromise, LAC is not the appropriate framework for dealing with issues related to these goals. A new purpose for the second step, then—in addition to those described by Stankey and others (1985)—is to assess, for each issue, whether or not LAC is an appropriate planning framework.

Consequences of the Proposed Change

An explicit articulation of goals and desired conditions at the start of the process should improve planning considerably. First, it makes it easier to determine which issues can be dealt with effectively within the LAC framework and which issues cannot. This is largely a function of whether or not goals are in conflict and subject to compromise (Cole and McCool, this proceedings). Explicit statements of desired conditions should also clarify the distinction between what is desired and what will be accepted in compromise situations. This is particularly critical wherever desired conditions are less clearly articulated or are more controversial than they are in wilderness. Stating goals explicitly, early in the process, should also help with (1) identification of indicators, (2) identification and implementation of management strategies, and (3) guidance in situations where conditions are "better" than acceptable but "worse" than desired.

Clarifications of Concept, Terminology, and Implementation

The following discussion, organized by step in the LAC process, summarizes the dialog that occurred during the workshop and recommendations that were advanced there or developed as we wrote this paper. Recommendations include clarifications of concept, recommended changes in terminology, implementational suggestions, and identification of issues that need further work.

Define and Describe Opportunity Classes

The issue here was primarily one of confusing or inappropriate terminology. The term "opportunity class" focuses undue attention on the concept of recreational opportunities. These different "classes" might contribute to improved management of many resource issues other than recreation. As Cole and Stankey (this proceedings) point out, the term "opportunity class" was adopted because an informal Forest Service policy existing in 1985 did not allow for zoning of wilderness. That policy is no longer in effect, so we recommend replacing the term "opportunity class" with the term "prescriptive management zone."

This terminology, already used in the VERP process, will be much more generally useful as LAC concepts are adopted outside wilderness and applied to issues other than recreation. Use of the adjective "prescriptive" emphasizes that the culmination of the zoning step is the prescription of future conditions rather than the description of existing conditions. Existing conditions are described and analyzed in this and the preceding step. However, the ultimate zone descriptions refer to the conditions that will be allowed or created—not the conditions that currently exist (although it is possible to prescribe future conditions that are identical to current conditions).

Some confusion exists about whether or not opportunity class descriptions refer to desired conditions. Prescriptive management zone descriptions refer to acceptable conditions rather than desired conditions. Desired conditions should be articulated in the new first step—definition of goals and statements of purpose. The prescriptive zone description step initiates the process of defining less-than-ideal (acceptable) conditions reflecting the need to compromise broad goals. At this step, those acceptable conditions are still stated as general, qualitative statements.

Select Indicators

The most critical issues at this step involve clarifying what indicators should refer to, the question of whether or not qualitative indicators are acceptable, and implementation problems resulting from lack of scientific information and inadequate monitoring protocols.

To What Should Indicators Refer?—There is substantial confusion about the attributes for which indicators should be developed. This can lead to the selection of inappropriate indicators.

Indicators should be developed for outputs (such as experiential and environmental conditions) rather than inputs (such as use levels), if possible. This principle is articulated frequently in discussions of recreation carrying capacity (Stankey and McCool 1984) and was recently repeated by a panel of ecologists in their suggestions about how to implement ecosystem management (Christensen and others 1996). Inputs may need to be managed, but it is the outputs that are of concern and that should be monitored. Having stated this ideal, however, we recognize that for some issues it may only be possible to develop indicators and standards for inputs (Merigliano and others, this proceedings).

As LAC was originally conceived, Stankey and others (1985) stated that indicators should refer to resource or social conditions in wilderness. However, indicators may serve broader functions. For example, Cole (1995a) has suggested that wilderness management plans might include

an indicator related to the risk of a fire burning outside of wilderness. Cole and Stankey (this proceedings) suggest that the LAC process involves defining compromise between conflicting goals—a compromise that is made explicit by developing indicators for the goal that ultimately constrains the other goal. In the case of fire, the desire to minimize risk to life and property (one goal) will ultimately constrain the desire for natural wilderness conditions, including a natural fire regime (a conflicting goal). In such situations, we need to be able to develop indicators for variables such as risk that are not resource or social conditions. We recommend modifying the definition of an indicator to include attributes other than resource or social conditions.

It is possible to develop indicators for important wilderness attributes that are not directly subject to management control (such as solitude achievement, within-group harmony, and so on) Proponents of this approach argue that these are the variables that most influence the quality of visitor experiences. While it may be true that experiential quality is determined primarily by factors not subject to direct management influence, management must focus on those attributes they can influence. Management has a responsibility to provide outstanding opportunities for high-quality experiences. However, management should not be held accountable if certain visitors are unable to achieve these experiences (because they fight with their spouse, get bit by mosquitoes, or are incompetent anglers), as long as the attributes that maximize opportunities for high quality experiences are in place.

Consequently, we continue to recommend that most emphasis in LAC should be on indicators of those attributes that represent compromises between goals and that are directly subject to management control rather than either direct measures of the visitor experience or important influences on experience that are not subject to management control. Management control should be construed in a broad context, however. For example, even though wilderness air quality is not directly subject to control by wilderness managers, it is controlled to some extent by external managers.

Qualitative Indicators—Much has been written about the characteristics of good indicators (Merigliano 1990; Watson and Cole 1992; Whittaker and Shelby 1992). The ability to measure and quantify are among the most important criteria. On the other hand, many important attributes of wilderness seem virtually impossible to quantify (Driver and others 1996). Clearly, indicators that can be quantified have substantial advantages compared to qualitative ones, because resultant monitoring data can be interpreted in a relatively unambiguous manner. Different evaluators are more likely to arrive at similar conclusions about whether or not standards are being met when indicators are amenable to quantification. However, what is unclear is whether qualitative indicators are totally unacceptable or merely inferior. If they are totally unacceptable, issues that are not amenable to quantification would have to be dealt with using some framework other than LAC.

Inadequate Attention to Monitoring Protocols—A common problem during implementation of a completed LAC plan is confusion about how to conduct monitoring and ambiguities in the interpretation of monitoring data. This is likely to occur when the procedural details of monitoring indicators are not given sufficient attention during the step when indicators are selected. Ritter (this proceedings) provides a good example from the Selway-Bitterroot Wilderness. The indicator selected for the issue of solitude was number of encounters with other groups, expressed as a probability. The standard based on this indicator, for one of the zones, was that there will be an 80 percent chance of encountering less than two other groups. When field personnel attempted to monitor this indicator, they encountered problems with deciding how managers could measure what visitors were encountering. They also had difficulty deciding how data collected could be expressed as probabilities.

This problem should be dealt with by giving more attention to monitoring protocols early in the LAC process. Before indicators are finalized, measurement and data analysis protocols need to be developed and field tested. This means that some field level monitoring must be conducted before this step can be completed. This is an illustration of why we recommend that practitioners work through the LAC process in an iterative rather than linear fashion.

Inadequate Science Foundation to Develop Indicators—For many issues, scientific knowledge is so rudimentary that there is little basis for identifying appropriate indicators. For other issues, there is a substantial knowledge base, but little attention has ever been directed toward identifying good indicators. In either case, planners are often unable to use an LAC framework to address critical issues because they are unable to formulate useful indicators for those issues.

To address this concern, we suggest that state-of-knowledge papers be developed on different issues for which one might want to develop indicators. These papers would describe the issue or problem, potential indicators, available monitoring protocols, and the pros and cons of alternatives. Such a thoughtful analysis would be preferable to a simple list of indicators such as that compiled by Watson and Cole (1992). Cole's (1989) review of campsite impact indicators and monitoring protocols provides one example of what such a review might include.

Specify Standards

Many different issues were raised regarding the specification of standards. Several involved conceptual clarifications about what standards are, what violation of standards implies, and how compatible the LAC process is with the principle of nondegradation. Other issues that were debated led to recommendations regarding the role of science in the formulation of standards and the appropriateness of changing standards once they have been specified.

Definition of What a Standards is—Substantial confusion exists about how standards relate to the concepts of acceptability and desirability and about meanings of the terms "standard," "objective," and "goal." This confusion has caused a number of problems, most notably inconsistencies in how violations of standards are treated and, therefore, how different places are managed.

Standards define minimally acceptable conditions. The conditions defined by standards should not be considered

unacceptable nor should they be considered desirable. Standards specify the departure from desired conditions that has been judged acceptable to avoid compromising another goal entirely. For example, some resource impact and loss of solitude is accepted to avoid the need to prohibit all recreation use. The reason minimally acceptable conditions are tolerated is not that management does not wish for or bother to maintain better conditions. Rather, minimally acceptable conditions are the best possible conditions, *given the constraints imposed by the need to compromise several goals simultaneously*. Minimally acceptable conditions, as expressed in standards, do not represent the conditions that would be desired in the absence of conflict and the need for compromise. Moreover, in the absence of need for compromise, conditions should be substantially "better" than those defined in standards (that is, closer to desired conditions).

In the LAC process, standards are not equivalent to objectives, although sometimes they can be viewed as objectives. If current conditions are "worse" than standards, the standards represent objectives that management can strive to achieve. However, where conditions are currently "better" than those specified in standards, the implication is that conditions will be permitted to deteriorate to the standard if the only way to maintain "better" conditions is to implement heavy-handed recreational restrictions. In this situation, the standard is not an objective that management strives to achieve. It defines a condition that management will allow to occur if it cannot be avoided without compromising other goals.

We recommend continuing to use the term "standard" rather than "goal," "desired future condition," or "objective." However, since the term "standard" has many different meanings in planning applications, we recommend using the term "LAC standard" to distinguish standards used in LAC and related processes from standards used elsewhere.

What Violation of Standards and Lack Thereof Imply—There is considerable disagreement about what violation of a standard implies. Is it a warning, an indication of need for further study? Or does it imply the need for immediate action? Conversely, what does lack of violation mean? Does it mean that everything is fine? Or is this the time to implement restrictive actions that will prevent future problems? Some of these interpretations of what violations of standards imply undermine the entire purpose of the LAC process—to define a balance between conflicting goals when both conflicting goals must be compromised.

Standards are absolute limits—a "line in the sand." They are not warnings. Once standards are reached, management must implement whatever actions are necessary—even if it means curtailing use—to avoid violation of standards. The LAC standards explicitly prescribe not only the *conditions* under which it is appropriate to compromise each of several conflicting goals, but also the *extent* to which each goal is compromised. Standards are the mechanism by which *extent* of compromise is regulated. If standards are not treated as absolute limits, this mechanism is defeated, and the increased objectivity and opportunity for shared decisionmaking that the LAC process provides are lost.

Just as it is critically important for managers to act whenever standards are violated, it is important that they not take *drastic* action when standards are not violated. To do so would again defeat the mechanism for balancing several conflicting goals. In dealing with the recreation carrying capacity issue for which LAC was originally formulated, this implies that recreation access and behavior should not be restricted to any substantial extent unless restrictions are necessary to keep conditions within standards. This does not mean that nonrestrictive management actions (such as visitor education) cannot be taken at any time or that restrictive actions cannot be taken when it is clear that conditions are deteriorating and standards will soon be violated. It does imply that managers should not implement highly restrictive actions in order to maintain conditions that are substantially better than standards. The legal foundation for this implication is the Wilderness Act's mandate that wilderness provide opportunities for "unconfined" recreation. There are likely to be differences of opinion about which management actions are appropriate (nonrestrictive) when standards are not violated. Therefore, we suggest that actions that are and are not appropriate be explicitly stated as part of the LAC process. Refer to the section "Identify Management Actions" later in this paper.

The Principle of Nondegradation and the LAC Process—The principle of nondegradation (Hendee and others 1990) is often subscribed to by wilderness managers and users. There is substantial confusion about the compatibility of this principle and the LAC process (Ritter, this proceedings). Problems stemming from this confusion include people rejecting the LAC process because they feel it undermines the principle of nondegradation, as well as people not recognizing the implications of decisions made during the LAC process to this principle.

The preceding discussion of what violations of standards mean has important implications for the principle of nondegradation. In its strictest form, the nondegradation principle asserts that no place in wilderness should be allowed to degrade from its present state or its state when it entered the wilderness system. The LAC process provides a ready mechanism for enforcing this principle. LAC standards simply need to be developed that are always at least as stringent as the current condition or some more "pristine" state. This implies, however, that most wildernesses must adopt a use limitation system to keep currently increasing use (Cole 1996) from causing further degradation. The only other option is to reduce per capita impact substantially, and there is little evidence that this can be done. For example, during the 1980's, impacts increased in many wildernesses that experienced little increase in use (Cole 1996). If a management regime based on use limitation is considered unacceptable, then it is important for decisionmakers to realize that they will be violating a strict interpretation of the principle of nondegradation. Further degradation of conditions will occur, with the degree of further degradation reflected in the extent to which LAC standards differ from existing conditions.

An alternative interpretation of the principle is that no "net" degradation occurs. Further degradation might be allowed in some places, if it is offset by improved conditions elsewhere. Again, the LAC process offers a mechanism that can readily accommodate such a strategy. LAC standards could be developed that are more stringent than current conditions in some places (these places will improve) and

less stringent than current conditions in other places (these places will deteriorate). Use limitation might be unnecessary in some places that subscribe to this interpretation of the nondegradation principle.

The Role of Science in the Specification of Standards—There are substantial differences of opinion about the degree to which empirical data can be directly translated into LAC standards. Managers have often looked to scientists to tell them where LAC standards should be set—hoping to avoid the need to make subjective decisions. Some scientists have encouraged this tendency by representing their results as indicative of where standards should be set. Stankey and others (1985), in contrast, state clearly that standards are judgments—subjective evaluations of the appropriate compromise between conflicting goals. At the root of this disagreement are beliefs about the relative importance of expert and experiential sources of knowledge (Stankey, this proceedings), Moreover, because decisions about the relative importance of these different sources of knowledge will cause the focus of decisionmaking power to shift, these decisions will influence the likelihood that the plan will be implemented and supported—both by managers and the public.

Scientists have generally used the concepts of thresholds and norms to support the view that empirical data can be directly translated into evaluative standards. Ecologists frequently look for thresholds, such as the level of vegetation cover below which accelerated erosion is likely to occur or the level of resource degradation beyond which the ability for natural recuperation is lost. Similarly social scientists have also attempted to identify thresholds, such as the number of encounters that causes a significant decrease in quality of experience. Most commonly this is referred to as the normative approach, which proponents state has great potential to put the issue (of evaluative standards) on an empirical basis (Shelby and others 1996).

There are both theoretical and practical problems with these approaches, however. Although there are clearly situations in which ecological thresholds can be identified, they may be more the exception than the rule. For example, there appear to be no apparent thresholds in the relationship between amount of trampling and resultant impact (Cole 1995b). Similarly, the existence of norms related to such variables as number of encounters has been questioned by many scientists (for example, Noe 1992; Roggenbuck and others 1991).

More fundamentally, advocates of an empirical, objective basis for developing standards appear to not appreciate that standards define a compromise between several conflicting goals. Consequently, data they can provide typically relate to just one of the goals and is only half the story. Information about ecological threshold conditions must be complemented by information about the "costs" of restricting use such that the threshold is not exceeded. Information about preferred or acceptable encounter levels must be complemented by information about the costs of restricting use to these encounter levels. Managers want their LAC standards to be scientifically valid but the notion of scientific validity is not useful in the context of evaluative standards. No LAC standard is more "scientifically valid" than any other.

Our position is that standards should be *informed by* science, but not *derived from* science. Empirical data can be used to describe the costs and benefits of alternative LAC standards. However, all costs and benefits need to be displayed. It is not sufficient to study just one side of the conflict. Encounter norm data (assuming it is valid) typically identifies the preferences of current user groups for acceptable conditions, *in the absence of a clear understanding of the tradeoffs that would need to be made to achieve these conditions.*

We recommend that, to be more directly useful in defining LAC standards, these evaluations should be placed in the context of tradeoffs. For example, visitors could be asked their opinion about a maximum acceptable number of encounters, given that this might result in restricted access. This approach would be useful if it was felt that current users, responding to visitor surveys, could make good decisions regarding the tradeoffs between low encounter rates and restrictions on access. However, it is not clear that current users should be placed in the position of having to make these tradeoffs. Moreover, the opinions of current users will always need to be complemented by other legitimate sources for evaluative judgments: decisionmakers, experts, organized interest groups, and the general population (Shelby and others 1996). Although empirical data relevant to the specification of standards will always be welcome, a higher priority for research may be the development of effective ways of incorporating diverse sources of knowledge into decisions about standards.

The Appropriateness of Changing Standards—Considerable disagreement exists about the conditions under which it is appropriate to change standards. Reluctance to change standards when it might be appropriate can result in (1) standards being ignored, (2) failure to take advantage of opportunities to increase the protection of resources and experiences, or (3) management regimes that are unacceptably restrictive. Conversely, changing standards when it is not appropriate undermines the purpose of the LAC process. Problems (situations where standards are violated) can be dealt with simply by redefining what constitutes a problem (by relaxing standards so that they are not violated).

Usually the issue is whether or not it is appropriate for standards to be relaxed, although questions about the appropriateness of making standards more stringent are equally valid. The issue of changing standards is usually raised with two different temporal scales in mind. The short-term concern can surface as soon as plan implementation begins. After LAC standards have been selected, existing conditions have been inventoried, and violations of standards have been identified, it might be decided that the "solutions" required to deal with violated standards create more "problems" than the "problems" the violated standards represent. If this is the case, it is our opinion that the standards are not good ones and we recommend that they be changed. The LAC process seeks to define the optimal compromise between the "benefits" of high-quality environmental and experiential conditions and the "costs" of the restrictive actions needed to maintain these conditions.

The step sequencing recommended in the original formulation of LAC (Stankey and others 1985) provided a mechanism for analyzing costs and benefits before a plan is finalized. The

recommendation was to inventory existing social and environmental conditions (step 4) before standards are finalized and to identify the management actions that will be needed to bring conditions into compliance with standards (step 7). Once necessary management actions are displayed, the "costs" of meeting standards (in terms of management restriction) should be clear. If costs appear unacceptably high, different standards can be specified. Through this iterative approach, carefully assessing the costs and benefits of alternative standards, the most acceptable compromise should emerge.

In several early applications of the LAC process (the Bob Marshall and Selway-Bitterroot, for example), planners decided it was too time-consuming to develop explicit descriptions of the management actions that will be needed to bring conditions into compliance with standards. In these places, the "costs" of meeting standards were not widely recognized until after the plan had been finalized. Consequently, there has been a reluctance to question or change standards (Ritter, this proceedings). We recommend that the step sequencing and implementational details of the original step 7 (Stankey and others 1985) be followed. For further discussion, refer to the section "Identify Management Actions" later in this paper.

Although it is important to set standards that will not cause more problems than they solve, it is also important to be courageous and bold in setting standards. Standards should not routinely accommodate existing conditions simply because this is the easiest course of action. In wilderness, for example, there are many places where conditions are unacceptable and the "costs" of restrictive management must be accepted. The key is to find the right balance between providing high quality experiences and minimal impact, on the one hand, and minimizing restrictive management on the other. If it becomes clear during plan implementation that standards have struck a poor balance, we believe it is appropriate to change them. However, we also believe there should be little need to change standards if management actions are carefully considered during development of the plan.

More problematic is the issue of whether standards should evolve over time—as society evolves. Both sides of this argument have valid points. One side argues that as society changes, definitions of what is desirable and acceptable should evolve so that wilderness continues to be supported and continues to meet the needs of a changing society. The other side argues, however, that if society constantly evolves toward a higher density, more-developed society, standards may always evolve toward ones that accept higher densities, more impact, and more development. This would result in loss of the most unique and valuable aspects of wilderness. One potential solution to this dilemma is to implement zoning, such that some zones are allowed to evolve and change (operationalized by changing LAC standards) while others are not. This important issue needs more substantive debate.

Identify Management Actions

This step has multiple purposes, some of which have been lost during applications of the LAC process. These multiple purposes need to be clarified and the procedural details of this step need to be emphasized to avoid problems. The most common problems result from merely listing possible management actions, rather than identifying those actions needed to bring standards into compliance. A second issue involves differences of opinion about the types of management actions that are appropriate to implement when standards are not violated. We recommend a procedural change to make decisions about the appropriateness of different actions more explicit.

During this step, Stankey and others (1985) proposed that specific management actions be identified for each existing violation of standards. They suggested that only actions that are likely to be effective in bringing standards into compliance within a reasonable timeframe be considered. The most obvious purpose of this step is to identify the management programs that must be implemented once the plan is finalized. This step has a second purpose, however. By identifying these required actions before the LAC process is finalized, decisionmakers should understand the "costs" in terms of restrictive actions that will be needed to achieve standards. If these costs exceed the benefits derived from achieving standards, then standards can be redefined. Consequently, there should be little need to change standards shortly after the LAC plan has been finalized.

When the LAC process was first implemented in the Bob Marshall Wilderness Complex, there were so many violations of standards that it was considered impractical to develop management actions for each violation. Consequently, a list of management actions was compiled, ranked from most to least preferred (on the basis of perceived visitor burden) for each type of problem and each opportunity class. This modification of the suggested process—undertaken as a matter of practicality—has had two negative ramifications. First, it made it more difficult to assess the social costs of the management program needed to comply with standards, before the plan was finalized. As a result, there is now some dissatisfaction with the standards that were selected. People question whether the standards can just be ignored (undermining the entire process), whether they can be changed (which many are reluctant to do), or whether they should implement the highly restrictive management needed to comply with standards (even if the costs of doing so exceed the benefits).

As noted in the last section, we strongly recommend using the step sequence and procedural details recommended in the original LAC formulation (Stankey and others 1985). Standards should not be finalized until decisionmakers have a clear idea of the management programs needed to bring conditions into compliance with standards. We should seek out innovative ways of dealing with the time-consuming task of listing management actions for every violation of standards.

One possibility is to describe requisite management actions for several examples of each type of standard violation. For example, managers could decide that locations where there were too many highly impacted campsites (places where a standard specifying a maximum number of highly impacted sites was violated) would be dealt with by requiring the use of designated campsites and instituting a site restoration program. If there were 100 locations where

there were too many highly impacted campsites, there would obviously be 100 locations where designated sites and restoration would be needed. Decisionmakers could envision what the costs of such a program would be to both visitors (the designated camping regulation) and management (substantial site restoration program and increased enforcement costs). They could assess these costs in relation to the benefits that would derive from using that standard and decide either to keep the standard or specify a different standard. Similar prototypic management strategies could be developed for violations of other standards, such as too many trail encounters.

The second negative ramification of ordering potential management actions from most to least preferred has been the reluctance of managers to implement less preferred actions, even if they are the only effective way to deal with violations of standards (Ritter, this proceedings). This is not a problem with the listing approach. It is a problem with how the list was developed and how it has been used. If a list is developed, we recommend that it be confined to actions that are likely to be effective in the short term. In addition, managers must exert the political will to do what is necessary to not violate standards, even if these actions are costly.

The final issue, related to the identification of management actions, is confusion and disparate views about the management actions that are appropriate when standards are not being violated. As noted earlier, goals such as freedom of access and freedom from behavioral restriction should not be compromised to maintain conditions substantially "better" than those specified in standards. Therefore, restrictive actions (such as limiting use, prohibiting campfires, and so on) should not be implemented unless they are necessary to avoid violations of standards. However, actions that do not curtail access or freedom of behavior (such as visitor education) should be implemented as a means of forestalling the need for more restrictive action.

Because there are differences of opinion about which actions are appropriate when standards have not been violated, we recommend development of two different lists of management actions. One list will consist of "preventive" management actions that could be undertaken at any time. These actions should not be too restrictive and should place little burden on the visitor. Most of these actions are diffuse in their effect and not likely to solve specific problems in reasonably short periods. These actions are appropriate even in situations where standards are not being violated, but they are unlikely to quickly correct problems.

"Corrective" management actions are generally more restrictive and should not be undertaken unless they are necessary to avoid violations of standards. These actions are more remedial in nature. They also are more likely to effectively solve problems in specific locations in reasonably short periods. This list of remedial, restrictive actions gives decisionmakers a sense of the costs of specified standards, once it is clear how many places are out of compliance with particular standards.

Implement Actions and Monitor

Two issues related to this step were discussed extensively at the workshop. The first issue was the problem of implementing the LAC plan when there is no sense of priorities for either management or monitoring. Typically, numerous violations of standards will be identified through the LAC process. Which places and which problems should be attacked first? Should initial attention be devoted to the conspicuous problems that develop in popular, frequently visited places? This is the most common management response. However, Cole (in press) provides a rationale for assigning a higher priority to lesser used and impacted places. He argues that these places can be considered the most precious and vulnerable places, as well as the ones most likely to benefit from management attention.

In addition, funds for monitoring are always limited. Which indicators should be given highest priority and which places should receive the most attention? Because prioritization is so dependent on the specifics of different areas and the people who care about those areas, we could not recommend specific types of indicators, places, or problems that should receive highest priority. We do recommend that attention be given to priorities for management and monitoring while the plan is still being developed. Decide which indicators, problems, and places should receive most attention and describe the rationale for those decisions. This will provide a helpful bridge between the planning and implementation stages of the LAC process.

The second issue discussed was a general concern for the lack of institutional support for monitoring. Inadequate funding makes it difficult for some places to conduct any monitoring at all. Moreover, where monitoring programs do exist, there is a tendency to select "simple" rather than "good" procedures and for the data collection procedures to be so unsystematic that data quality is highly questionable. Many root causes of inadequate support were identified. One contributor is the high degree of compartmentalization in the agencies (Stankey, this proceedings). Is monitoring a planning task or a management task? Should it be done by researchers or managers? Is it part of LAC or not? Frequently, nobody accepts the responsibility for monitoring.

Another contributing factor is the view that LAC is a one-shot effort to create a product rather than an ongoing management process. Planners are not in a good position to do monitoring, while the implementors view monitoring as a task for the planners who developed the LAC product. Again, this often results in monitoring responsibilities being shirked. A final contributor—in wilderness management and probably elsewhere—is an inadequate commitment to professional management. Ultimately, the group could only conclude that monitoring was critical to professional management. If the agencies are serious about professionalism, they simply must institutionalize monitoring—make it a part of the ongoing management job.

Further suggestions can be made about coping with minimal funding for monitoring. Regardless of funding levels, monitoring data needs to be valid. Validity is as much a function of knowing the limitations of the data as of the accuracy and precision of the data. Precision should be as high as possible for a given methodology, but relatively imprecise techniques can be acceptable. If imprecise techniques are used, this lack of precision must be reflected in the indicators and standards that are written and in the way monitoring data are interpreted.

Concluding Observations

Throughout the course of the workshop, the dialog frequently involved reiteration of three fundamental observations about procedural aspects of the LAC process. These observations are made in a number of papers in this proceedings. We will repeat them here as a conclusion to this paper.

1. The LAC process is a means of resolving conflict between opposing goals. The notion of compromise is at the core of LAC. Procedurally, compromise is accomplished through the explicit specification of minimally acceptable conditions for one of the goals in conflict—the goal that ultimately constrains others. Many management issues do not require compromise. Other planning tools are more appropriate for dealing with these issues.

This perspective of the LAC process as just one planning tool—useful for dealing with certain types of issues—embedded within a more comprehensive planning process, has several important implications. For example, monitoring is one of the critical elements of the LAC process. However, the monitoring task should not be confined to those indicators identified through an LAC process. For many important issues, the LAC process is either unnecessary or difficult to use due to concerns about writing meaningful standards. Monitoring indicators relevant to these issues can contribute to improved management, even if standards are not written and the LAC process is not used.

2. It is more helpful to treat the LAC as a process than as a product. It is more a framework for rationally and openly dealing with certain issues than a means of developing a written comprehensive management plan. It is a continuous process, rather than a one-shot undertaking. Consequently, it blurs the line between management and planning.

3. The LAC process should be applied in an iterative rather than linear fashion. One must think forward about the implications of early decisions for later steps and think back about how decisions late in the process affect early steps. Some steps in the process are returned to again and again. Nevertheless, sequencing is important. Certain steps must come before certain others. The procedures can be flexibly adapted but within limits.

References

Christensen, Norman L.; Bartuska, Ann M.; Brown, James H.; Carpenter, Stephen; D'Antonio, Carla; Francis, Robert; Franklin, Jerry F.; MacMahon, James A.; Noss, Reed F.; Parsons, David J.; Peterson, Charles H.; Turner, Monica G.; Woodmansee, Robert G. 1996. The report of the Ecological Society of America committee on the scientific basis for ecosystem management. Ecological Applications. 6: 665-691.

Cole, David N. 1989. Wilderness campsite monitoring methods: a sourcebook. Gen. Tech. Rep. INT-259. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 57 p.

Cole, David N. 1995a. Defining fire and wilderness objectives: applying limits of acceptable change. In: Brown, James K.; Mutch, Robert W.; Spoon, Charles W.; Wakimoto, Ronald H., tech. coords. Proceedings: symposium on fire in wilderness and park management; 1993 March 30-April 1; Missoula, MT. Gen. Tech. Rep. INT-GTR-320. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 42-47.

Cole, David N. 1995b. Experimental trampling of vegetation. I. Relationship between trampling intensity and vegetation response. Journal of Applied Ecology. 32: 203-214.

Cole, David N. 1996. Wilderness recreation in the United States: trends in use, users, and impacts. International Journal of Wilderness. 2(3): 14-18.

Cole, David N. [In press]. Recreation management priorities are misplaced: allocate more resources to low-use wilderness. International Journal of Wilderness.

Driver, B. L.; Dustin, Daniel; Baltic, Tony; Elsner, Gary; Peterson, George. 1996. Nature and the human spirit: toward an expanded land management ethic. State College, PA: Venture Publishing. 465 p.

Hendee, John C.; Stankey, George H.; Lucas, Robert C. 1990. Wilderness management, 2d ed. Golden, CO: Fulcrum Publishing. 546 p.

Merigliano, Linda. 1990. Indicators to monitor the wilderness recreation experience. In: Lime, David W., ed. Proceedings, Managing America's enduring wilderness resources symposium. 1989 September 11-17; Minneapolis, MN: St. Paul, MN. University of Minnesota: 156-162.

Noe, F. P. 1992. Further questions about the measurement and conceptualization of backcountry norms. Journal of Leisure Research. 24: 86-92.

Roggenbuck, J. W.; Williams, D. R.; Bange, S. P.; Dean D. J. 1991. River float trip encounter norms: questioning the use of the social norms concept. Journal of Leisure Research. 23: 133-153.

Shelby, Bo; Vaske, Jerry J.; Donnelly, Maureen P. 1996. Norms, standards, and natural resources. Leisure Sciences. 18: 103-123.

Stankey, George H.; Cole, David N.; Lucas, Robert C.; Petersen, Margaret E.; Frissell, Sidney S. 1985. The Limits of Acceptable Change (LAC) system for wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Stankey, George H.; McCool, Stephen F. 1984. Carrying capacity in recreational settings: evolution, appraisal, and application. Leisure Sciences. 6: 453-473.

Watson, Alan; Cole, David. 1992. LAC indicators: an evaluation of progress and list of proposed indicators. In: Merigliano, Linda, ed. Ideas for limits of acceptable change process, book two. Washington, DC: U.S. Department of Agriculture, Forest Service, Recreation, Cultural Resources and Wilderness Management Staff: 65-84.

Whittaker, Doug; Shelby, Bo. 1992. Developing good indicators: criteria, characteristics, and sources. In: Shelby, Bo; Stankey, George; Shindler, Bruce, tech. eds. Defining wilderness quality: the role of standards in wilderness management—a workshop proceedings; 1990 April 10-11; Fort Collins, CO: Gen. Tech. Rep. PNW-GTR-305. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 6-12.

Limits of Acceptable Change and Natural Resources Planning: When is LAC Useful, When is it Not?

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Abstract—Limits of Acceptable Change (LAC) was originally formulated to deal with the issue of recreation carrying capacity in wilderness. Enthusiasm for the process has led to questions about its applicability to a broad range of natural resource issues—both within and outside of protected areas. This paper uses a generic version of the LAC process to identify situations where LAC can usefully be applied and situations where it cannot. LAC's primary usefulness is in situations where management goals are in conflict, where it is possible to compromise all goals somewhat, and where planners are willing to establish a hierarchy among goals. In addition, it is necessary to write standards for the most important (constraining) goals—standards that are measurable, attainable, and useful for judging the acceptability of future conditions.

Limits of Acceptable Change (LAC) and related processes have been widely embraced as innovative and useful frameworks for dealing with recreation management issues in wilderness (McCoy and others 1995). Consequently, there has been considerable enthusiasm expressed about applying these systems outside wilderness and to issues other than recreation. The utility of LAC-like frameworks outside wilderness has already been demonstrated. Development of the VERP process demonstrated that LAC concepts can be applied in the frontcountry of National Parks (Hof and Lime, this proceedings). LAC-type processes have also been used to deal with issues other than recreation, although these processes are seldom referred to as a LAC process.

Given that LAC has been extended beyond recreational carrying capacity issues in wilderness, the question to address is under what conditions is the LAC framework useful and under what conditions is it not useful? To answer this question, it is critical to define the LAC process in more generic terms than Stankey and others (1985) did in their original formulation of the process. The workshop participants agreed that the generic process described in Cole and Stankey (this proceedings) represented the LAC process conceptually.

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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A Generic LAC Process

In brief, the LAC process involves the following six steps. Refer to Cole and Stankey (this proceedings) for more detail and an illustration of how this six step process was used to deal with the recreation carrying capacity issue.

Step 1. Agree that two or more goals are in conflict. The LAC process is fundamentally a means of resolving conflict. Goals conflict whenever it is impossible to simultaneously optimize conditions for all management goals.

Step 2. Establish that all goals must be compromised to some extent.

Step 3. Decide which conflicting goal(s) will ultimately constrain the other goal(s). In other words, a hierarchy of goals must be established. If there are multiple constraining goals, either these constraining goals cannot conflict with each other or it must be possible to establish a hierarchy among the constraining goals.

Step 4. Write indicators and standards, as well as monitor the ultimately constraining goal(s). Indicators must be measurably and standards must be attainable. They also must be useful for judging the acceptability of future conditions. It is important to develop monitoring protocols and field test them to make certain that indicators can be measured.

Step 5. Allow the ultimately constraining goal(s) to be compromised until the standard is reached. The process of balancing conflicting goals begins by allowing the most important goal(s)—the one(s) for which standards have been written—to be compromised somewhat. Standards define the maximum amount of compromise that will be tolerated.

Step 6. Compromise the other goal(s) so standards are never violated.

Situations in Which LAC is Useful

By understanding the details of the process just outlined, it becomes easier to assess what conditions must apply if the LAC process is to be useful. By working through the six steps, it is possible to assess whether or not LAC is likely to apply in any given situation. As an example of a situation where LAC was useful, consider the approach adopted by local government in Missoula, MT, to deal with concern about pollution from wood burning stoves. The approach developed is fundamentally a LAC process, although it was not referred to as such and it deals with an issue other than recreation on lands outside wilderness.

In Missoula, wood burning stoves are a popular method of heating houses. However, in the winter the city is prone to temperature inversions that trap cold air in the valley bottom. Pollution, in the form of excessive particulate matter, is a common problem when this occurs. Local government used a LAC-like process to deal with this situation. The six steps can be used as a framework for describing what they did.

Step 1. The two goals that are in conflict are (1) allowing Missoulians to heat their homes with wood and (2) maintaining healthy air quality. Neither goal can be optimized without compromising the other goal.

Step 2. The decision was made to compromise each goal to some extent. Alternatively, wood stoves could have been banned entirely (optimizing the air quality goal) or it could have been decided that wood burning would be allowed regardless of air quality (optimizing the goal of being free to use wood stoves). If either of these decisions had been made, a LAC-type process would not have been necessary.

Step 3. The decision was made that maintaining healthy air quality would ultimately constrain freedom to use wood stoves. If such a goal hierarchy had not been established (if the goals of healthy air and freedom to use wood stoves were considered equally important), a LAC-type process would not have worked. Some other means of compromising between goals would have been necessary.

Step 4. The indicator selected was amount of particulate matter in the air and a quantitative standard was written that prescribes a maximum acceptable level of particulate matter in the air. This indicator is measurable and the standard is attainable.

Step 5. Missoula residents are allowed to use their wood stoves—and degrade air quality—as long as the particulate matter standard is not exceeded.

Step 6. When the particulate matter standard is exceeded, or in danger of being exceeded, use of wood stoves is prohibited.

This illustrates how the LAC framework is applicable to a number of issues other than recreation management. The first four steps of the generic LAC process suggest four conditions that must apply if the LAC process is to be useful. First, there must be at least two conflicting goals. Second, there must be a willingness to compromise all conflicting goals. Third, there must be a willingness to consider one or more of the conflicting goals to ultimately constrain other goals. Fourth, it must be possible to write measurable and attainable standards that quantify the minimally acceptable state of the ultimately constraining goal(s).

Another requirement of standards—if LAC is to be used—is that they must be useful for judging the acceptability of future conditions. This should be possible in situations where the preferred conditions of the attribute for which the standard is being written is either unchangeable or subject to direct measurement. For example, in the case of concern about the invasion of exotic species in protected areas, the desired state of "no exotic species" will be as applicable in the future as it is today. Because this desired state is unchangeable, it provides a meaningful reference for any standard written to accept a limited degree of exotic invasion. A standard, such as "no more than 10 percent of the area occupied by exotic species," is measurable, presumably attainable, and a meaningful basis for judging acceptability in the future. For many issues of concern, preferred conditions are relatively unchangeable.

When the preferred conditions of an attribute changes over time, LAC standards can still be written as a maximum deviation between existing and desired conditions, if those conditions can be measured both now and in the future. For example, consider the case of standards to address recreation impact on vegetation at campsites. A meaningful standard cannot be written for vegetation cover on campsites, because the preferred vegetation cover is variable from year to year, as well as from site to site. Instead, a LAC standard can be written as "no more than 50 percent vegetation loss on any campsite." This can be assessed by measuring vegetation cover on both campsites and neighboring undisturbed sites (indicative of conditions on the campsite prior to use). Although vegetation cover changes over time, the acceptable deviation between existing and desired conditions is constant. Such a standard will provide a meaningful measure for judging future acceptability. Standards based on deviations between impacted places and undisturbed reference sites should be possible to develop wherever impacts are localized, leaving some places undisturbed.

Situations in Which LAC is Not Useful

The first four steps of the generic LAC process are also useful in identifying situations in which LAC is not useful.

Step 1. If there is no conflict between goals, there is no need for a LAC process. In many recreation areas, for example, a common management goal is to have high quality interpretive displays. Attempts to maximize the quality of interpretive displays are not likely to conflict substantially with other goals of the recreation area. Consequently, LAC concepts do not help with that portion of recreation planning that deals with interpretive displays. For many aspects of recreation planning (for example, trail maintenance, sign policies, provision of toilets, and so on) there is little conflict between goals and, therefore, no need for LAC. The same is undoubtedly true of many nonrecreational situations.

Where there is no conflict, planners should simply define desired conditions and implement management actions to progress toward that desired state. It might also be worthwhile to monitor progress and even to write a standard that defines minimally acceptable progress toward the desired state. However, such a standard is not a LAC standard. It is a management performance standard—not a standard defining a compromise between goals. Consequently, once minimally acceptable conditions are met, there is no reason not to implement actions to progress further toward the desired state.

Step 2. If there is conflict between goals, but one of the goals cannot be compromised, a LAC process is not appropriate. For example, there may be situations where recreation use threatens prehistoric sites and there is zero tolerance of disturbance at these sites. In this case, the goals of allowing recreational access to prehistoric sites and avoiding disturbance of those sites are in conflict, but the site disturbance goal cannot be compromised. Many other examples exist—both in recreation planning and planning for issues other than recreation—where there is zero tolerance or ability to

compromise and, therefore, LAC is an inappropriate planning framework. In these situations, managers should state the desired condition for the goal not subject to compromise and do whatever is necessary to avoid compromising that goal.

Step 3. If managers cannot establish a hierarchy of goals, in which some goals constrain others, LAC will not work. This hierarchy of goals is necessary because standards must be written for the constraining goal(s)—and this goal only. If standards were written for all conflicting goals it would create situations where one or the other set of standards would be violated and could not be brought back into compliance without violating the other standard.

This is the reason standards were not written for managerial conditions in the original application of LAC to wilderness recreation, even though "unconfined" experiences are important in wilderness. Although it might be desirable for visitors to remote, near-pristine places to never contact a ranger patrol, it might be necessary for rangers to patrol these areas to keep them near pristine. If standards were written that prescribed both near-pristine conditions and lack of ranger contact, management would have to decide which standard to violate. In the original application of LAC to recreation management in wilderness, it was assumed that preservation of conditions should constrain managerial conditions as well as freedom of access and freedom from restrictions. Consequently, standards were only written for this most important goal—the preservation of natural conditions and solitude in wilderness.

Step 4. Even for management issues for which there is conflict, room for compromise, and a hierarchy of goals, the LAC process can only be applied if it is possible to write measurable and attainable standards that quantify the minimally acceptable state of the ultimately constraining goal. Qualitative standards may suffice but only if it is possible for different individuals to agree on whether or not standards are being violated. We simply do not have the experience to judge whether qualitative standards are totally unacceptable or merely inferior to quantitative standards.

As noted earlier, LAC standards do not appear to be useful in situations where the desired state of the attribute for which standards are to be written is both changeable and impossible to measure. This is a common situation where the issue of concern is the effect of a pervasive (as opposed to localized) threat on natural ecosystems. For example, we might wish to limit the adverse effects of air pollution on tree growth rates by writing a LAC standard limiting declines in tree growth rates. However, we know that desired tree growth rates in the future will differ unpredictably from those that exist today, due to natural climatic oscillations. Moreover, desired growth rates (those occurring in the absence of air pollution) will be impossible to measure because all trees will be affected by air pollution in the future. This leaves us with a few options for developing standards, but all options have drawbacks. Refer to Merigliano and others (this proceedings) for further discussion of these options.

Conclusions

We conclude that the LAC process has widespread applicability to issues other than recreation management and in places other than protected areas. In protected areas, LAC can be useful in dealing with management of a range of threats to resource conditions that can be considered either desirable or acceptable as long as they do not cause *too much* impact. LAC may be even more widely applicable outside protected areas than within protected areas. Outside protected areas, naturalness is not such a critical goal. Consequently, it is more acceptable to define standards in static terms and be content to achieve those conditions. However, because there may be much less agreement about goals and their relative importance (Brunson, this proceedings), LAC may be more difficult to implement outside protected areas.

We also conclude that the LAC process is not a useful framework for dealing with all of the issues that must be dealt with in wilderness and park recreation management planning. Many recreation management and visitor experience quality issues do not involve conflict or compromise. Examples include the quality of interpretive displays, trail maintenance levels, or the effects of intentional exotic species introductions. Other issues, such as the impacts of recreation on wildlife, do involve conflict and compromise, but the utility of LAC is limited by the apparent impossibility of writing meaningful quantitative standards.

The LAC process should be thought of as a framework for dealing with certain issues that are frequently confronted in the planning and management process. Those issues to which it applies are the particularly sticky issues that require conflict resolution. The LAC process provides a framework for working collaboratively to explicitly define a compromise between conflicting goals. In attempting to decide whether LAC is an appropriate process to use, it might be helpful to answer the following questions:

1. Am I attempting to resolve conflict between several goals?
2. Am I willing to compromise all goals to some extent?
3. Am I willing to establish a hierarchy of goals—decide that some goals will constrain other goals?
4. Is it possible to write measurable and attainable standards that can be useful for assessing acceptability in the future?

The LAC framework, as currently formulated, should be useful if—and only if—all four questions can be answered in the affirmative.

References

McCoy, K. Lynn; Krumpe, Edwin E.; Allen, Stewart. 1995. Limits of acceptable change: evaluating implementation by the U.S. Forest Service. International Journal of Wilderness. 1(2): 18-22.

Stankey, George H.; Cole, David N.; Lucas, Robert C.; Petersen, Margaret E.; Frissell, Sidney S. 1985. The limits of acceptable change (LAC) system for wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Experiencing Limits of Acceptable Change: Some Thoughts After a Decade of Implementation

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Abstract—Wilderness managers and researchers have experienced implementation of the Limits of Acceptable Change planning system for over a decade. In a sense, implementation of LAC has been a broad scale experiment in planning, with the hypothesis being that LAC processes are more effective approaches to deal with questions of recreation management in protected areas than the carrying capacity paradigm. Workshop participants identified a number of both positive and negative consequences resulting from their experience with LAC. This paper synthesizes these outcomes by discussing the positive results, describing the problems encountered, and outlining lessons learned.

A fundamental objective of the workshop was to identify and archive insights of managers and researchers gained from experiences with Limits of Acceptable Change (The terms Limits of Acceptable Change or LAC processes will be used to refer to LAC, VERP, VAMP, and other similar visitor management systems for ease of presentation). LAC processes represent a large scale experiment, in the sense that they embody a different approach to managing recreation problems in wilderness and backcountry settings. Understanding how these processes have worked, including their strengths and weaknesses, helps future managers and researchers implement techniques to exploit their strengths while avoiding or addressing their weaknesses. During the latter stages of the workshop, participants specifically addressed the strengths and weaknesses of LAC through a round robin discussion. We present the results of this discussion under three themes: (1) positive outcomes; (2) problems and barriers encountered; and (3) lessons learned. For each of these themes, we list and summarize the dialogue that occurred at the workshop as well as our own interpretation.

Positive Outcomes

Increased Attention Toward Management of Biophysical and Social Conditions

Concern about protected area values has always formed the foundation for attempts to establish recreational carrying capacities. But the carrying capacity paradigm was limited in its utility to address this concern through its implicit emphasis on establishing limits on recreational use. Traditionally, managers focused attention on action rather than understanding. This is evident in the carrying capacity approach where managers would feel successful if they limited use to a "magic number" regardless of whether this number was derived from a genuine understanding of conditions, trends in these conditions, and the management actions needed to keep conditions within acceptable limits. Even though numerous authors held that objectives were necessary to determine carrying capacities (for example, Lime and Stankey 1971), managers and researchers long pursued attempts to relate use levels to biophysical or social impacts. In the sense used here, such objectives (specifically written) would inform planners of the acceptable conditions permitted in the area. LAC has changed this to making the concern about outcomes and conditions more explicit.

By focusing attention on desired or acceptable conditions, or both, in the first few components, LAC directs attention to the more useful question: "What are the appropriate or acceptable conditions, and how do we manage for them?" By emphasizing discussion over conditions first, LAC enhances the focus on determining appropriate conditions. For example, the new first step identifying area goals specifically incorporates the notion of documenting desired conditions, significance of the area's resources and values, and specific legislative mandates. In (new) Step 3, prescriptive management zones are defined and identify the acceptable conditions permitted in each of the zones. Discussion of appropriate management actions, where debate in wilderness management frequently transpires, does not appear until much later in the process (now Step 8), after agreement on desired and acceptable conditions has been reached. The result has been to stimulate discussion about how much human-induced impact is acceptable, the tradeoffs among competing goals, and explicit consideration of human values and judgments into decisionmaking. This has led to a more complete understanding of the location, intensity, and type of biophysical impacts resulting from recreational use, and a more explicit discussion of how much impact is acceptable.

Enhanced Monitoring of Wilderness Conditions and Effectiveness of Management Actions

LAC has significantly changed management by explicitly incorporating a monitoring component. LAC specifically incorporates monitoring as (new) Step 10 and is also incorporated into VERP and VAMP processes. Monitoring is

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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defined as periodic and systematic measurement and display of indicator variables. Monitoring is essential to determining what types of changes in social and biophysical conditions may be emerging over time and critical to determining the effectiveness of management actions in addressing impacts and concerns. Professional ethics demand that managers monitor the outcomes of their decisions. Monitoring provides information vital to management because it may suggest needs for revisions in actions or acceptable conditions.

In addition, the Government Performance and Results Act (GPRA) of 1993 requires agencies to develop measures of outcomes and outputs, and to report on them annually, thus increasing the emphasis on monitoring. LAC processes can assist protected area management agencies to meet this obligation by specific consideration of monitoring in the planning process.

Increased Attention on Zoning as Means of Protecting Pristine Qualities

Both the VERP and LAC planning systems recognize that diversity exists in biophysical and social conditions within protected areas. This diversity in conditions may be desirable, acceptable, or even unacceptable. In some places within a given protected area, compromises in pristine conditions have to be made to allow recreational access. In other places in the same area, conditions are closer to pristine and planners may decide to maintain this situation. Management can take action to protect the diversity by continuing to protect the more pristine areas (Haas and others 1987). By making this decision explicit, managers have constructed a framework upon which they can assess the effects of decisions, such as restricting camping in one area that will lead to camping in other areas.

LAC processes help accomplish this task by allocating areas (new Step 3) to different prescriptive management zones (see Cole and McCool, this proceedings). Such zoning is essentially a land-use allocation, and its most fundamental purpose is to limit the spread of human-induced impacts. Zoning of wilderness and National Park Service backcountry in the past has been controversial. Some have argued, for example, that there is only one wilderness, and therefore prescriptive management zoning is prohibited. On the other hand, Congress mandated, in Section 4(b) of the Wilderness Act, that agencies manage wilderness to protect the values for which the area was established. Prescriptive management zoning provides a powerful tool to meet this mandate.

Increased Trackability and Explicitness of Protected Area Decisionmaking

One of the challenges of protected area management is the large number of subjective, value-laden decisions that characterize planning processes. Such decisions involve, for example, identification of desired conditions, statements of standards, ranking of management actions, and selection of indicators. Cole and McCool (this proceedings) contend that science plays an important role in planning, but the role is limited to informing decisions, not driving them. And, as Friedmann (1987) has insisted, science is limited in its capacity as a basis for social action.

Protected area planning occurs in highly politicized and charged settings, in which agency actions are not only scrupulously scrutinized, but trust also tends to be an underlying issue. Carrying capacity approaches often did not explicitly link use limit policies to improvements in desired or acceptable conditions. Consequently, additional controversy was frequently generated as affected publics struggled to understand and accept not only the problem, but its purported solution as well. In addition, carrying capacity methods did not explicitly reveal the necessary tradeoffs among competing goals.

When value judgments are made in managing publicly managed resources, it is in the public interest to reveal the various beliefs, information, and biases that were involved in the decision. LAC provides a rationale and recommended sequence for their components; thus, affected publics and planners can understand why certain activities are being conducted when they are being conducted. In addition, LAC processes, when combined with suitable public involvement, identify the type of information needed by the public as well as how the information will be used.

Thus, a major goal of planning processes is to make explicit the procedure by which decisions are made. Achieving this goal reduces the amount of implicit subjectivity in decision processes and enhances understanding, if not agreement, about how such decisions were made. Explicitness also prevents "hidden agendas" from prevailing. The tradeoff between permitting unrestricted public access and protecting pristine conditions is the most fundamental decision made in managing recreation in protected areas. LAC, by forcing explicitness and a measure of systematic thinking, reveals not only what goals are defined as the ultimately constraining ones, but also discloses how far compromises between goals will eventually ensue. The public then is informed and can express judgments about the appropriateness of these compromises for publicly managed resources.

Furthermore, the practice of involving the public throughout LAC (Krumpe and McCool, this proceedings; McCool 1996; McCoy and others 1995), particularly in the Forest Service, has led not only to well accepted ranking of high priority management actions, but also to a reduction in the likelihood of adopting inappropriate management actions. The level of discourse afforded by public involvement results in enhanced understanding of what issues, concerns, and values are of greatest importance, and the relative acceptability of management actions to address them. Socolow (1976) once stated that analyses are not about what is important, but rather what analysts feel is interesting. Public participation combined with a systematic process forces analysts and publics to justify decisions, explain priorities, divulge biases, and clarify proposed actions.

Finally, LAC encourages separating prescriptive decisions from descriptive activities: describing *what is* is a different decision than determining *what ought to be*. Carrying capacity determinations in the past often confused establishing a use limit, for example, with allocating a resource to a specific type of recreation opportunity (Schreyer 1976). This confusion resulted in two activities occurring simultaneously, further exacerbating an already perplexing debate over the "carrying capacity" of a protected area. By separating description (such as the inventory component) from prescription (standards) in time and space, decisions can be more easily tracked.

Enhanced Visibility of the Costs of Wilderness Management

Through the process of identifying management actions likely to lead to reductions in unacceptable conditions or restrictions on recreational access, LAC has made costs (financial, social, and economic) more explicit. In a real sense, LAC forces examination of the intrinsic tradeoffs that must be initiated in compromising between two or more competing goals. These tradeoffs are some of the costs associated with wilderness management.

Understanding the costs, and their multidimensional nature, is fundamental to informed public policy, allows deliberation of the benefits received for the costs incurred, and helps Federal agencies meet the requirements of GPRA. This allows planners and the publics to understand not only the efficiency of management actions, but their distributional effects as well. A lot of different interests are involved in protected area management: wilderness visitors (a diverse group), outfitters, wildlife groups, water users, and agency managers.

LAC reveals costs through not only examining the consequences of alternatives (typical of environmental analysis procedures) but also through an extensive analysis of desired and acceptable conditions and by identification of management actions likely to be effective. For example, a discussion of how much the ultimately constraining goal will be compromised naturally leads to consideration of what management actions will be needed to avoid further compromise (that is, conditions violate standards, and thus must be corrected). Much of this discussion will focus on effectiveness, but we feel an equally important, and contentious, component will deal with equity issues: Who (usually some wilderness user group, but increasingly vicarious users) will bear the costs of management actions needed to avoid unacceptable conditions? To what extent are costs borne related to benefits received? Are costs relative to impacts caused? This discussion would be constructive because out of conflict arises creative solutions, the conflict providing incentives for interests to find ways of avoiding unacceptable conditions while minimizing costs.

Encouraged Innovative Approaches to Citizen Participation in Wilderness Decisionmaking

By combining a systematic planning process (in the tradition of rational-comprehensive planning) with a new approach to public participation based on the theory of transactive planning (Friedmann 1973), LAC has successfully integrated involvement with planning (McCool and Ashor 1984; Stokes 1990). Such involvement, built upon dialogue leading to mutual learning, has increased the success rate of LAC applications (McCoy and others 1995). The significant level of involvement in wilderness decisions has led to other important outcomes. These include heightened understanding of wilderness management, greater interest in implementation, a sense of ownership in the plan and area, and an improved sense of mutual respect between agency managers and affected publics. In addition, public participation has served as an institutional memory for agencies with frequent turnover of personnel.

As we noted above, heightened public involvement is important because of the series of subjective value judgments that are involved in protected area management, and the diversity of interests affected. Intimate public participation is also based on an assumption that experiential knowledge as well as scientific knowledge has much to contribute to decisionmaking. Such public involvement tends to increase the quality of discussion, rather than dilute it (Paehlke and Torgerson 1990), ensures that socially relevant issues are considered, and forces agency biases and policies to be not only revealed but justified.

As LAC was originally designed, it followed the classical rational-comprehensive model of planning, with public involvement indicated only at the issue identification and alternative evaluation stages (McCool and Ashor 1984). However, the original experiment in the Bob Marshall Wilderness Complex in Montana (Stankey and others 1984) that combined transactive planning with LAC flourished in its capacity to not only develop a plan, but also provided opportunities for learning between interests and the agencies involved. Moore (1994) noted that the process was also successful because it led to a sense of ownership in the plan, allowed interests to be represented, and overcame formerly strained relationships between the Forest Service and its publics.

Public participation without the structure of a planning process probably would not have led to such a set of outcomes. Likewise, if LAC had proceeded without its marriage to transactive planning, Forest Service officials would probably still either be writing the plan or responding to administrative appeals or court litigation. By combining the two approaches, managers were able to create an almost ideal planning setting in the midst of an often-contentious debate over Forest Service management of public lands. Participants were all trained by a facilitator (the senior author) in the LAC process. Participants understood, as individual steps (or components) were initiated, why things were being done when they were done. They knew what type of information the Forest Service needed and why, and how their input would be used. Because of the face-to-face planning process, acknowledgment of input was immediate.

While VERP (USDI National Park Service 1997) now recognizes the importance of public participation beyond the NEPA procedural requirements, the National Park Service has been more reluctant to engage the public using the principles of transactive planning. Nevertheless, the value of public input into VERP is formally acknowledged and serves similar useful functions as it does for LAC. We would expect that public participation, in general, would increase as public land managing agencies increasingly embrace the need for better and more useful public input.

Improved Capacity of Federal Agencies to Manage Wilderness

By providing a structure for decisions, public participation, and policy-relevant research, LAC processes have strengthened agency capability to protect the resources within its charge. Changing the paradigm of public participation has improved relationships with affected publics so they are now more effective supporters of management

efforts. LAC has stimulated additional research, by both agency and academic scientists, on questions of critical importance to wilderness management. Focusing concern on conditions, not use limits, leads to more informed discussion about how wilderness values will be protected. These outcomes are significant steps in improving wilderness management efforts. They challenge institutional arrangements that deter coordinated management and improve the efficacy of manager effort. Because wilderness managers tend to have a close-knit network, success stories (and failures) are quickly passed around and tested in a variety of new situations. This experimentation and learning itself is a key contributor to increasing the organization's capability.

Barriers Encountered

Most wilderness managers would state that LAC is complex. Embarking on an LAC planning process may challenge the most competent wilderness planner, and even the most practiced public meeting facilitator will struggle with balancing multiple competing interests. Considerable wilderness management, and organizational and facilitation expertise is needed to implement LAC processes. Workshop participants identified five fundamental barriers and problems encountered in implementation that will be briefly discussed below. We discount the criticism of LAC as being "too complicated." LAC is no more complicated than other land management and planning systems. LAC cannot be used as a cookbook by a nonthinking automaton. LAC is the simplest available approach for effectively dealing with the complexity of the real world.

Inadequate Commitment to Good Planning and Management

Protected area planning and management increasingly occurs within a context of declining budgets, government downsizing, and privatization of some functions. The effects of these changes have been to accelerate manager concerns about agency commitment to planning and management. Too often, it seems, managers are asked to implement programs without the funding to do a professional job. This lack of commitment extends to a paucity of support for needed research, lack of training and continuing education opportunities, fatigue among personnel as they are continually asked to engage in new planning activities before the old ones see results on the ground, and a lack of accountability for planning decisions.

These problems are not unique to LAC processes. And, one could make an argument that LAC, if fully supported initially, would actually decrease management costs in the long run. However, protected area managers appear to be in a constant state of concern about their ability to meet the public's expectations, achieve agency-mandated targets, and preserve wilderness and backcountry resources. LAC is sometimes overlaid upon these concerns, and is itself often a source of additional confusion and frustration.

We can offer no practical counsel for a way out of this predicament. Agency resources are a function of national priorities as reflected in the political and appropriations process. An era of caretaking may be the manager's immediate future. Unfortunately, the caretaking also occurs within a context of growing scarcity of wilderness and backcountry resources and an increasingly large and diverse set of demands on them. While managers "wait" for additional resources, the decision space to address the issues confronting them declines irreversibly.

Compartmentalization of Functions

Protected area management is intrinsically an integrative responsibility. Managers, planners, and scientists all need to provide their expertise to solve numerous, related problems. Developing a prescribed natural fire policy, for example, cannot escape considering the effects on visitor behavior and travel patterns, the expected and received recreational experience, profitability of outfitters, habitat and forage availability for wild animals, and a host of water and air quality parameters. Yet, protected area managing agencies are organized along largely functional lines, with a vertical bureaucratic orientation, providing few internal incentives for integrative solutions. Securing information, even minimal amounts, may face a host of almost insurmountable obstacles. For example, Forest Service managers needing information for LAC decisions cannot easily contract for research. Science is a function of the agency's research branch, which has its own set of priorities; the managing branch itself cannot conduct or sponsor research. Understanding visitor needs and preferences may require research on them; such research must be approved by the Office of Management and Budget (if sponsored by the Federal government), a procedure not required when biological data are being collected.

The tendency to separate monitoring and implementation from planning leads inevitably to a lack of ownership by field managers in plans developed by others—a similar problem confronting affected publics. We noted earlier (Cole and McCool, this proceedings) that, for example, definitions of indicators must account for how they will be monitored. If totally separate people/organizations are involved in both activities there are likely to be significant "disconnects" in implementation. In many protected area organizations, planning is the responsibility of higher levels of management; implementation is left to personnel at the lower rungs. Implementation may even be conducted by seasonals who would have little understanding (because of the lack of involvement in the planning) of the rationale for both management actions and monitoring. Planners may thus be confronted with considerable resistance for implementation.

Legal Framework for Public Participation is in Disarray

Krumpe and McCool (this proceedings) presented a variety of arguments for including affected publics in LAC processes. At precisely the moment in time when managers recognized the important values of public participation and when the public is widely demanding greater access to governmental decisionmaking, the legal framework for participation has become increasingly confused. The primary reason for this confusion is the Federal Advisory

Committee Act (FACA) signed into law in 1972. This legislation states that unless chartered by the Federal government, advisory committees to Federal agencies must be composed solely of full-time Federal employees. While committees can be chartered, the process is arduous, and the disclosure and reporting requirements are equally onerous. Federal agencies operating in politicized settings, where accusations of lawbreaking are more frequent than rare, have been exacting in their cautiousness not to be accused of ignoring one more law. This has had the effect of shattering the more innovative public participation programs.

Lack of Attention to Experiential Knowledge

Friedmann's (1987) admonition that action in society requires both scientific and experiential knowledge has structured much of the discussion around public participation (Krumpe and McCool, this proceedings). Within agencies that have had an outstanding tradition of science-based management, this position has been difficult to maintain. Experiential knowledge does not come in the form of tables of numbers, means, standard deviations, or theoretical concepts. This form of knowledge is expressed through anecdotes, emotions, and recollections. It is not designed to systematically observe a phenomenon and collect data on it. Nevertheless, the claims to superiority made by scientists of their form of knowledge are often invalid (Friedmann 1987) for a variety of reasons. (We note that scientists themselves often use anecdotal observations to construct reality. An incident in the fall of 1997, where an Orca killer whale was observed attacking a great white shark, caused marine biologists to "totally rethink" their theories of which species was the dominant predator. The total rethinking was the result of an accidental observation by tourists.)

Given the lack of institutional support for data collection and the increased desire by the public to contribute to decisions in a constructive sense, planners must attend to experiential knowledge as one, but not sole, source of information upon which to base decisions. Planners must conceive of LAC not as an expert-driven system, but as a framework that is implemented collaboratively—in the sense of working through issues and questions (Yankelovich 1991)—with agency planners, scientists, and publics recognizing the legitimacy of the others' contributions.

Agencies Often Lack "Political Will" to Implement Actions

In our discussions at the workshop and with a host of protected area managers employed by several agencies, lack of political will (the willingness to make needed, but controversial decisions) among senior level decisionmakers is often cited as a major concern in implementation of policy. Again, this problem is not one restricted to LAC. It may reflect the overtly increasing politicization of all government agencies. We would expect "lack of political will" to be a widening problem as the conflict over scarce resources escalates, the stakes grow ever larger, the words harsher, the politics increasingly strident. An effective public participation program may be able to deal with this situation somewhat, because it represents a redistribution of power, an enhanced opportunity to learn and understand problems, and, for the participating public, an opening for organizing an effective constituency to counteract "interest group" politics. For this reason alone, public participation processes may be controversial among some segments of the public, for their access and influence is declining in a relative sense.

Lessons Learned

Workshop participants represented many perspectives and roles in implementing LAC processes, evaluating them, and using them as frameworks for research. We attempted to capture this experience by asking participants to identify the principal lessons learned from their engagement with LAC processes. Here, we identify these lessons through a series of propositions.

Protected Area Planning is a Political Process in Politicized Settings

Planning in protected areas is largely a matter of allocating resources to specific uses and values. In particular, much of LAC planning has focused on managing different types of recreational opportunities and experiences. It concerns resolving conflict between recreational access and environmental protection. In these tasks, science and technical information play important roles in identifying options and describing consequences, but do not provide answers. Krumpe and McCool (this proceedings) note that the types of situations often confronting wilderness managers are frequently characterized by a lack of agreement on goals and little scientific agreement on cause-effect relationships. In these situations, allocation and management decisions are inherently social and political rather than technical because human relationships are involved.

Planning occurs within increasingly politicized settings in which (1) agencies have lost the political authority to implement proposed actions (in contrast to the legal authority, which most agencies continue to maintain, to conduct planning); and (2) interest groups vie for the veto power over implementation of agency actions. Planning cannot proceed efficiently unless agencies understand this context and develop mechanisms to work effectively within it. What this means is that planning must be normative in terms of understanding whom the planner serves (Friedmann 1993). It must be interactive, which promotes the dialogue and mutual learning upon which societal action is based. Planning would be learning focused, because we often don't have the needed information to describe cause-effect relationships. Planners and the publics may not understand what is "broke" and, therefore, would oppose the "fix." Planning would also emphasize informed consent of those affected. Friedmann (1993) argues that planning should be political, because plans encounter resistance, and overcoming resistance requires strategic action. Such action is intrinsically political because it organizes resources to accomplish socially desirable goals.

Defending Decisions Requires a Trackable/Traceable Process

The politicized settings that characterize protected area management require decision processes that can be tracked, so that planners may inform affected publics of how decisions were made. In a litigative context, documentation of process is important in defending decisions. Access to decision processes provide a reviewer/plaintiff/defendant with information critical to understand, if not to agree with, the decisions made. Because LAC occurs in a reasoned sequence, interested groups can determine connections and linkages among the different decisions. The trackable nature of decisions made in LAC, however, is a necessary but not sufficient condition for defense of management actions. In learning settings, trackable processes provide an opportunity for the negative feedback necessary to understand consequences and potentially modify decisions.

Planning is a Process, Not Necessarily a Product

Planning is a process, but the output is often defined as a plan—a document. Planning critics often point to plans that sit on shelves gathering dust and that are never implemented. Planning is about implementation, not about producing a document. We view planning as a process of intervening in events to ensure that a desired future is attained. Ackoff (1974) noted that problems never stay solved because situations change. Thus, planning is a continual process of implementing actions, evaluation, and modification where necessary. Products of planning include a document (the "plan"), changes "on the ground," and enhanced knowledge and learning. These increase capacities of agencies and their constituencies to respond to change.

The components of LAC processes provide planners with a framework for thinking about issues and problems and for resolving conflict. Procedurally based planning works well only in situations with a single, agreed upon goal, where beliefs about causes and effects are well established. LAC is a process more than a procedure or set of protocols.

Vigilance in Grounding Planning in Legislation is Critical

As we have argued, planning proceeds within an external context—it is informed by the broader, larger forces that influence wilderness and protected areas. These forces include legislation, political activity and party politics, agency policy, and the regional socio-political climate. Understanding legislative history and mandates is critical to protected area planning. While the Wilderness Act provides overall guidance it also allows considerable administrative discretion. Individual Wildernesses and National Parks may have additional specific legislation and Congressional direction attached to them. For example, the Great Bear Wilderness in Montana contains an active backcountry airstrip that is permitted to continue, not because of formal legislation, but because of the "sense" of Congress as indicated in the committee report that accompanies the legislation. Reviewing and understanding the committee's discussion was useful in developing management actions for the airstrip in the Bob Marshall Wilderness Complex LAC process. While it may seem obvious that one understand legislative direction and intent, these sometimes get lost in planning processes.

Understanding the Institutional Context for LAC Processes is Fundamental to Planning and Implementation

A variety of institutions provide the context for wilderness management. These include legislation and associated processes, the agencies and their cultures that are legally required to manage and protect wilderness resources, and other agencies that deal with resources that occur within wilderness (such as state fish and game departments). Still other legislation, such as the Clean Air and Clean Water Acts and their administrative agencies, bear upon how wilderness is managed. Procedures for evaluating personnel performance, normative beliefs about how planning ought to occur, and the structure and activity of nongovernmental organizations influence how and what decisions will be made.

This institutional framework has tremendous influence over how planning is conducted. LAC planners must assimilate this complex environment in their planning journey if they wish to make effective plans. For example, there has long been a debate as to how LAC processes relate to NEPA and the planning requirements of NFMA. Some Forest Service planners have rejected the notion of a wilderness planning process because NFMA, in their judgment, allows only one plan per forest, therefore, one planning procedure. Likewise, as Hof and Lime (this proceedings) note, VERP has been assimilated into the National Park Service general management planning process because of institutional perspectives on what agency component conducts planning and how. Such views determine if and how LAC processes will be used.

Planning Success is Measured Multidimensionally

Ultimately, the goal of planning is to intervene in a series of anticipated events to move toward a future that we project to be a more desirable one. Therefore, a fundamental measure of the success of our planning is the extent to which that future was changed to meet our desires. LAC is a specific tool designed, as Cole and Stankey (this proceedings) argue, to resolve conflict between two goals: protection of wilderness conditions and unrestricted recreational access. Thus, a principal measure of success would be the extent to which the conflict is resolved. Did the proposed management actions reduce levels of human-induced impacts with a minimum of restriction on public access?

However, a variety of recent research suggests that in planning situations using collaborative learning processes, success has other essential dimensions (Guthrie 1997; Moore 1994). These other dimensions include learning, relationship building, responsibility ("ownership" of the plan by

various affected groups), representation of interests, and socio-political acceptability. If one assumes that these are useful outcomes, then planning should be designed to achieve them.

Learning is an Important Objective in the LAC Process

LAC was originally developed in the tradition of rational-comprehensive planning: emphasis on goals (in this case, desired conditions, opportunity class descriptions and standards); search for all reasonable alternatives and evaluation of those alternatives. However, in its first complete application in the Bob Marshall Wilderness in Montana, it was carried out as a transactive planning process (Friedmann 1973), which is characterized most fundamentally by its emphasis on learning. The emphasis on learning is important when there is disagreement about available knowledge, and where goals are contested. We focus on learning here as a separate lesson from that immediately above because it is so important. An emphasis on learning helps wilderness managers understand the consequences of actions, and implies that monitoring must proceed systematically, not as a separate component, but integral to wilderness management. Learning suggests that our management is to a large degree experimental, that we can't predict with accuracy all the outcomes of an action, and that we can adapt our management to new information.

References

Ackoff, R. 1974. Redesigning the future. New York, NY: John Wiley and Sons. 260 p.

Friedmann, J. 1993. Toward a non-Euclidean mode of planning. Journal of the American Planning Association. 59(4): 482-485.

Friedmann, J. 1987. Planning in the public domain: From knowledge to action. Princeton, NJ: Princeton University Press. 501 p.

Friedmann, J. 1973. Retracking America. Garden City, NJ: Anchor Press/Doubleday. 289 p.

Guthrie, K. 1997. Measures of success in public involvement processes: An investigation of how managers, researchers and members of the public define success. Unpublished M.S. thesis, Missoula, MT: University of Montana. 98 p.

Haas, G. E.; Driver, B. L.; Brown, P. J.; Lucas, R. C. 1987. Wilderness management zoning. Journal of Forestry. 85(12): 17-21.

Lime, D. W.; Stankey, G. H. 1971. Carrying capacity: Maintaining outdoor recreation quality. In: Recreation symposium proceedings. Gen. Tech. Rep. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

McCool, S. F. 1996. Limits of acceptable change: A framework for managing national protected areas: Experiences from the United States. Paper presented at Workshop on Impact Management in Marine Parks, Kuala Lumpur, MALAYSIA. August 13-14, 1996.

McCool, S. F.; Ashor, J. 1984. Politics and rivers: Creating effective citizen involvement in management decisions. In: Proceedings, national river recreation symposium; October 31-November 3, 1984; Baton Rouge, LA. Baton Rouge, LA: Louisiana State University: 136-151.

McCoy, K. L.; Krumpe, E. E.; Allen, S. 1995. Limits of Acceptable Change Planning—Evaluating implementation by the U.S. Forest Service. International Journal of Wilderness. 1(2): 18-22.

Moore, S. A. 1994. Interaction processes and the resolution of environmental disputes: Case studies from public land planning in the United States and Australia. Unpublished Ph.D. Dissertation. Seattle, WA: University of Washington.

Paehlke, R.; Torgerson, D. 1990. Environmental politics and the administrative state. In: Paehlke, R.; Torgerson, D., eds. Managing leviathan: Environmental politics and the administrative state. Peterborough, Ontario: Broadview Press: 285-302.

Schreyer, R. 1976. Sociological and political factors in carrying capacity decision-making. In: Proceedings, visitor capacity conference; 1976 April 29-30; Fort Worth, TX. Fort Worth, TX: National Park Service, Southwestern Regional Office.

Socolow, R. H. 1976. Failures of discourse: Obstacles to the integration of environmental values into natural resource policy. In: Tribe, L. H.; Schelling, C. S.; Boss, J., eds. When values conflict: Essays on environmental analysis, discourse and discussion. Cambridge, MA: Ballinger Publishing: 1-33.

Stankey, G. H.; McCool, S. F.; Stokes, G. L. 1984. Limits of Acceptable Change: A new framework for managing the Bob Marshall Wilderness Complex. Western Wildlands. 10(3): 33-37.

Stokes, G. L. 1990. The evolution of wilderness management. Journal of Forestry. 88(10): 15-20.

U.S. Department of the Interior, National Park Service. 1997. The Visitor Experience and Resource Protection (VERP) Framework. A Handbook for Planners and Managers. Denver, CO: Denver Service Center, National Park Service.

Yankelovich, D. 1991. Coming to public judgment: Making democracy work in a complex world. Syracuse, NY: Syracuse University Press. 290 p.

Annotated Bibliography

Annotated Bibliography of Publications for LAC Applications

Stephen F. McCool
David N. Cole

Workshop participants suggested that one worthwhile addition to the proceedings would be an annotated bibliography useful to a Limits of Acceptable Change practitioner. This bibliography, then, emphasizes articles and papers on the practical, as opposed to the conceptual side, of LAC process discussions. One could envision this as a minimum library on the LAC process. Because works included here should be easily accessible, master's theses, doctoral dissertations, and unpublished presentations at symposia and workshops are excluded. Some topics could potentially involve hundreds of citations (such as management actions or public involvement). We emphasized synthesis works as opposed to empirical papers reporting results of individual studies. We also recognize that many worthwhile contributions have been omitted. The emphasis is on the literature we were most familiar with. We have divided the material into five major sections: (1) handbooks on LAC-type processes; (2) recreation impacts; (3) indicators, monitoring, and standards; (4) management actions; and (5) public involvement.

LAC-Type Processes

Graefe, A. R.; Kuss, F. R.; Vaske, J. J. 1990. Visitor impact management: the planning framework. Washington, DC: National Parks and Conservation Association. 105 p.

Visitor Impact Management (VIM) serves as one of the foundations of the National Park Service VERP system. This monograph describes the initial framework for VIM and provides an overall summary of visitor impact research. Readers would find it a useful description of the rationale for the various components of VIM.

Graham, R.; Lawrence, R., eds. 1989. Towards serving visitors and managing heritage resources: proceedings of a North American workshop on visitor management in parks and protected areas. Waterloo, ON: University of Waterloo. 520 p.

This proceedings contains several articles on basic principles and concepts for LAC processes. Several articles are specific to LAC, VIM, and Canadian approaches to visitor management. Sections on interpretation, trends in visitation, and monitoring are also included.

National Park Service. 1997. The visitor experience and resource protection (VERP) framework: a handbook for planners and managers. Denver, CO: U.S. Department of the Interior, National Park Service, Denver Service Center. 103 p.

This handbook describes the VERP process in detail, providing many helpful hints on how best to implement the process.

Shelby, B.; Heberlein, T. A. 1986. Carrying capacity in recreation settings. Corvallis, OR: Oregon State University Press. 164 p.

This book looks at an approach to evaluating the relationship between amount of use and use limitation. It briefly describes a process (C-CAP) for determining carrying capacities based on social criteria.

Stankey, G. H.; Cole, D. N.; Lucas, R. C.; Petersen, M. E.; Frissell, S. S. 1985. The limits of acceptable change (LAC) system for wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

This report describes the LAC process step-by-step and illustrates it using a hypothetical wilderness example.

Recreation Impacts

Cole, D. N. 1994. Wilderness threats matrix: a framework for assessing impacts. Res. Pap. INT- 475. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 14 p.

A comprehensive framework for assessing threats to wilderness is represented as a matrix of potential threats and attributes of wilderness character. Cells in the matrix represent the impacts of threats on each attribute. The report describes potential applications of the matrix. This matrix can help planners, managers and researchers during the scoping process and to assess research and management priorities.

Hammit, W. E.; Cole, D. N. 1987. Wildland recreation: ecology and management. New York: John Wiley and Sons. 341 p.

This book describes the impacts of recreation on soil, vegetation, animals, and water. It relates recreation impacts to the environmental and use-related factors that influence impact. It also describes management approaches for dealing with impacts.

Knight, R. L.; Gutzwiller, K. J., eds. 1995. Wildlife and recreationists: coexistence through management and research. Washington, DC: Island Press. 372 p.

Research on the impacts of recreation on wildlife includes finding ways by which impacts can be mitigated without curtailing recreation use.

In: McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20–22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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Kuss, F. R.; Graefe, A. R.; Vaske, J. J. 1990. Visitor impact management: a review of research. Washington, DC: National Parks and Conservation Association. 256 p

The literature concerning both biophysical and social impacts of recreational use is extensive. This publication summarizes hundreds of studies of impacts, and organizes findings into five key principles, linking recreational use with impact. Readers would find it a useful publication when confronting significant impact questions.

Indicators, Standards, and Monitoring

Cole, D. 1989. Wilderness campsite monitoring methods: a sourcebook. Gen. Tech. Rep INT-259. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 57 p.

This report summarizes and evaluates information on techniques that have been developed for monitoring campsites, particularly in backcountry and wilderness areas. The author seeks to identify limitations and weaknesses and to suggest useful approaches.

Cole, D. N. 1983. Assessing and monitoring backcountry trail conditions. Res. Pap. INT-303. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 10 p.

Application of three types of trail assessment techniques—replicable measurements, rapid surveys, and censuses—can provide useful information to backcountry managers.

Hollenhorst, S.; Gardner, L. 1994. The indicator performance estimate approach to determining acceptable wilderness conditions. Environmental Management. 18(6): 901-906.

One method overcomes two limitations of the LAC process by using of a modified importance-performance approach. The method, using indicator performance estimates (IPEs), results in two types of information for each indicator: (1) importance, or visitor opinion as to the degree of influence the indicator has on wilderness experience, and (2) performance, or the degree to which an indicator exceeds or is within visitor standards. The results for each indicator are presented graphically. This technique allows managers to more systematically and effectively utilize information routinely collected during the limits of acceptable change wilderness planning process.

Marion, J. L. 1991. Developing a natural resource inventory and monitoring program for visitor impacts on recreation sites: a procedural manual. Natural Resources Report NPS/NRVT/NRR-91/06 Denver, CO: U.S. Department of the Interior, National Park Service. 59 p.

Biophysical impacts resulting from recreation includes changes to vegetation, soil, water, and wildlife. This monograph focuses on developing an inventory and monitoring program assessing visitor impacts at recreation sites. It outlines the important components of a monitoring program.

Martin, S. R. 1990. A framework for monitoring experiential conditions In: Lime, D., ed. Managing America's enduring wilderness resource; 1989 September 11-17; Minneapolis, MN. St. Paul, MN: Minnesota Extension Service, and Minnesota Agricultural Experiment Station, University of Minnesota: 170-175.

Monitoring social and biophysical conditions is essential to ensuring not only quality visitor experiences, but also to ensure that resource quality meets objectives. The author provides a framework of the components of a monitoring plan that should serve as a useful guideline for backcountry managers.

Merigliano, L. 1990. Indicators to monitor wilderness conditions. In: Lime, D., ed. Managing America's enduring wilderness resource; 1989 September 11-17; Minneapolis, MN. St. Paul, MN: Minnesota Extension Service, and Minnesota Agricultural Experiment Station, University of Minnesota: 205-209.

What indicators would be useful to monitor when managing backcountry resources? This paper lists potential indicators and suggests the criteria by which to select indicators. Managers would find this article helpful when initiating an LAC process because it assists them in addressing one of the fundamental concerns that visitors and managers have.

Noss, R. F. 1990. Indicators for monitoring biodiversity: a hierarchial approach. Conservation Biology. 4(4): 355-364.

Three primary attributes of biodiversity—composition, structure, and function—are expanded into a nested hierarchy that incorporates elements of each attribute at four levels of organization: regional landscape, community-ecosystem, population-species, and genetic. The author recommends a general guideline to proceed from the top down, beginning with a coarse scale inventory of landscape pattern, vegetation, habitat structure, and species distributions, then overlaying data on stress levels to identify biologically significant areas at high risk of impoverishment. This paper serves as an example of how indicators are developed and applied.

Shelby, B.; Vaske, J. J.; Harris, R. 1988. User standards for ecological impacts at wilderness campsites. Journal Leisure Research. 20(3): 249-256.

Studies of social impacts of recreationists in wilderness settings provide a conceptual and methodological framework for analyzing norms for ecological impacts. Three normative characteristics—range of tolerable conditions, norm intensity, and norm crystallization—are measured quantitatively using data from the Mt. Jefferson Wilderness. The model could be applied to a wilderness setting.

Shelby, B.; Stankey, G. H.; Shindler, B. 1992. Defining wilderness quality: the role of standards in wilderness management—a workshop proceedings; 1990 April 10-11; Fort Collins, CO. PNW-GTR-305. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 114 p.

This proceedings represents the collective efforts of many wilderness managers and researchers to review the body of management and research experience with regard to standards. Together they assessed the current use of

standards, summarized and integrated what has been learned, capitalized on the diversity of this work, and developed ideas about directions for the future. This work is helpful to managers and researchers who want to identify indicators and standards that capture the important qualities of wilderness and recreation experiences.

Watson, A.; Cole, D.; Merigliano, L. 1992. LAC Indicators: An evaluation of progress and list of proposed indicators. Washington, DC: U.S. Department of Agriculture, Forest Service.

This paper briefly reviews and compares some desirable characteristics of indicators and list of indicators that have been proposed or adopted in LAC plans. The authors evaluate progress to date and identify three major problems in selecting LAC indicators. Indicators from dispersed backcountry and wild and scenic rivers, as well as from designated wilderness, are included.

Williams, D. R.; Roggenbuck, J. W.; Patterson; M. E.; Watson, A. E. 1992. The variability of user-based impact standards for wilderness management. Forest Science. 38(4): 738-756.

This report examines four sources of variation in user based social impact standards: occasion, wilderness area, encounter type, and respondent. Social impact standards can be generalized across wilderness areas and to a lesser degree across measurement occasions. Respondents appear to share a high level of sensitivity to encounters, but the task of assigning a numerical standard may be too abstract to be meaningful. This can be useful to provide guidelines to future researchers and managers to obtain user-based standards.

Yuan, S. B.; Maiorano, M.; Yuan, S. M.; Hoshide, G. T. 1995. Techniques and equipment for gathering visitor use data on recreation sites. Missoula, MT: Technology and Development Program, U.S. Department of Agriculture, Forest Service. 159 p.

Estimating recreational use levels has been a challenge to recreation managers that has tended to be ignored over the last 20 years. This monograph reviews techniques for estimating recreational use at developed sites. While the focus is on developed sites, a reader would gain useful ideas about important recreation use estimation principles.

Management Actions

Cole, D. N.; Petersen, M. E.; Lucas, R. C. 1987. Managing wilderness recreation use: common problems and potential solutions. Gen. Tech. Rep. INT-230. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 60 p.

This report summarizes information on alternative management tactics available for dealing with common wilderness recreation problems. It is broken into two sections: the first deals with basic strategies for attacking problems; the second describes the nature of general problems resulting from recreational use of wilderness. This report was designed as a "troubleshooting" guide that managers can turn to when faced with problems.

Douchette, J. E.; Cole, D. N. 1993. Wilderness visitor education: information about alternative techniques. Gen. Tech. Rep. INT-295. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 37 p.

Educating visitors about appropriate techniques is an often recommended management action. This publication details the different education and information techniques available, providing a brief description of their use and effectiveness.

Manning, R. E. 1979. Strategies for managing recreational use of National Parks. Parks. 4(1): 13-15.

This paper presents a classification of strategies for managing recreational use of our National Parks. The value of the material lies not in the classification system as much as in the logical and comprehensive array of alternatives available to National Park managers to deal with the environmental and social impacts of expanding recreation use. The author draws five conclusions from this research and expands upon them to provide a comprehensive list of alternatives for managers.

Marion, J. L.; Roggenbuck, J. W.; Manning, R. E. 1993. Problems and practices in backcountry recreation management: a survey of National Park Service managers. NPS/NRVT/NNR-93/12. Denver, CO: U.S. Department of the Interior, National Park Service, Natural Resources Publication Office. 48 p.

Results of a survey of managers of backcountry areas managed by the National Park Service shows that various management actions have been taken to deal with recreation management programs. Included are managers' opinions about which actions are most effective.

McCool, S. F.; Christensen, N. A. 1996. Alleviating congestion in parks and recreation areas through direct management of visitor behavior In: Lime, D. W., ed. Congestion and crowding in the National Park System. St. Paul, MN: Minnesota Agricultural Experiment Station: 67-84.

The authors summarize research on "direct management" of visitors, which includes actions that regulate, rather than inform or educate visitors about appropriate behavior. The authors briefly discuss issues associated with identifying what is a direct management technique.

McCool, S. F.; Lime, D. W. 1989. Attitudes of visitors toward outdoor recreation management policy. Athens, GA: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station.

This summary of perceptions and attitudes visitors hold toward different types of management policy particularly looks at attitudes toward a variety of use limitation policies. Information on the acceptability of use limitation policies would be useful to managers determining appropriate strategies for managing use when standards are violated.

Peterson, G. L.; Lime, D. W. 1979. People and their behavior: a challenge for recreation management. Journal of Forestry. 77: 343-346.

Visitor management may be directed toward causes of behavior, factors influencing visitor decisions about appropriate behavior, or consequences of behavior. The authors provide this framework for understanding what actions may be appropriate or effective in dealing with visitor induced impacts.

Stankey, G. H.; Baden, J. 1977. Rationing wilderness recreation use: methods, problems, guidelines. Res. Pap. INT-192. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 20 p.

If use must be limited, it also often must be rationed if demand is higher than the use limit provides. This monograph discusses the costs, benefits, and consequences of alternative use rationing methods. It outlines who benefits and who loses with different techniques.

Vander Stoep, G. A.; Roggenbuck, J. W. 1996. Is your park being "loved to death?" Using communications and other indirect techniques to battle the park "love bug". Lime, D. W., ed. Congestion and crowding in the National Park System; St. Paul, MN: Minnesota Agricultural Experiment Station: 85-132.

Information and education are forms of persuasive communications. Understanding the fundamental premises of different approaches to information and education helps managers select effective strategies. The authors present several models of persuasive communications and detail the implications for management of congestion in front and backcountry situations.

Wang, T. L.; Anderson, D. H.; Lime, D. W. 1997. A decision-making framework to maintain desired resource and social conditions in recreational settings. St. Paul, MN: The Cooperative Park Studies Unit, University of Minnesota. 236 p.

Often, recreation management techniques are chosen more for their intuitive appeal than following a studied examination of costs and consequences. These authors provide a framework for understanding selection of specific management actions as well as the acceptability of biophysical and social conditions. The work is useful as a listing and examination of what techniques might be appropriate.

Public Involvement

McCool, S. F.; Ashor, J. L. 1984. Politics and rivers: creating effective citizen involvement in management decisions. In: National River Recreation Symposium; 1984 October 31-November 4; Baton Rouge, LA. Baton Rouge, LA: Louisiana State University: 136-151.

Public participation has often been a component of Limits of Acceptable Change. This partnership was first initiated in the early 1980's in the Bob Marshall Wilderness Complex. The authors compare perceptions of citizens involved in this planning process with one based on traditional methods of public participation. Implications for river recreation planning are presented along with guidelines for organizing citizen task forces.

McCoy, L.; Krumpe, E. E.; Allen, S. 1995. Limits of acceptable change planning—evaluating implementation by the U.S. Forest Service. International Journal of Wilderness. 1(2): 18-22.

In a study of the effectiveness of LAC-based planning as it has been implemented by the Forest Service, LAC is completed more thoroughly and there is greater public satisfaction with the process when the public is intimately involved.

Moore, S. A. Defining successful environmental dispute resolution: Case studies from public land planning in the United States and Canada. Environmental Impact Assessment Review. 16: 151-169.

What makes for a successful resolution of a dispute? A comparative analysis of public participation in protected area management including the Bob Marshall Wilderness, shows that success is multidimensional—that is, not only is plan implementation an important measure, but such dimensions as learning, interest group representation, and relationships among participating groups are also important.

McCool, Stephen F.; Cole, David N., comps. 1997. Proceedings—Limits of Acceptable Change and related planning processes: progress and future directions; 1997 May 20-22; Missoula, MT. Gen. Tech. Rep. INT-GTR-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 84 p.

Experience with Limits of Acceptable Change (LAC) and related planning processes has accumulated since the mid-1980's. These processes were developed as a means of dealing with recreation carrying capacity issues in wilderness and National Parks. These processes clearly also have application outside of protected areas and to issues other than recreation management. This proceedings represents an attempt to learn from that experience and suggest means of increasing the future utility of these processes.

Keywords: carrying capacity, park management, planning, public involvement, recreation management, wilderness management

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