

10 Strategies and Concepts of Management

In the chapters on impacts to resource components, we developed an understanding of how recreational use alters elements of the natural environment. Then, in Parts III and IV we explored factors that influence the nature, magnitude, and geographic distribution of impacts. Now it is time to apply this knowledge to management. Management cannot—and indeed should not—eliminate impact. Cleared trails and campsites, for example, are desirable environmental changes in many recreation areas. Management should control impacts, however, by manipulating the factors that influence impact patterns. In this chapter we will start with some general principles that summarize what we have learned in earlier chapters. Then we will discuss some planning concepts and frameworks and management strategies that can be useful in guiding management. This should set the stage for the more detailed descriptions of management techniques that follow in Chapters 11, 12, and 13.

GENERAL PRINCIPLES

The following are the general principles discussed in previous chapters.

1. Change is an all-pervasive characteristic of natural environments. The norm in undisturbed wildlands is continuous change—*succession*, to use the ecological terminology. When people are introduced into the natural scene, particularly when they come in large numbers, the natural direction and rate of change are often altered. In many cases ecosystem processes are accelerated. Erosion provides a good example. Many stream banks are constantly being worn away by the action of running water. This is a natural process. Where canoeists beach their boats at a picnic spot, however, erosion can be increased greatly, accomplishing in a few years what would have taken decades or centuries. In a case such as the suppression of fire, ecosystem processes—in this case, natural disturbance by fire—are slowed down. This, too, represents a serious impact. In other cases the entire direction of successional processes is diverted. Clearing and constructing a trail, replacing an undisturbed forest floor environment with a flat, compacted, barren, sunlit surface, represents a radical departure from the natural course of events.

Change is natural; thus management will generally not seek to halt change; rather, it will seek to halt undesirable change. How do we agree on what is an undesirable

change? In wilderness and many national park environments, where preservation of natural conditions is an important goal, most but not all human-caused change is undesirable. Elsewhere human-caused changes that improve recreational opportunities are often considered desirable.

One important criterion for deciding whether or not an impact is undesirable relates to whether it tends to be self-limiting. Certain impacts tend to stabilize over time as they approach some limit of maximum change. Well-built trails, for example, are far from being in a natural state, but they deteriorate little over time. Other impacts get progressively worse over time. Trails that ascend steep slopes and lack drainage devices to divert water off the tread will continue to erode until all soil is gone. Impacts that are not self-limiting are generally more serious than those that are.

The desirability of change and, therefore, whether or not an impact should be attacked by management, depends on a recreation area's objectives and also, perhaps unfortunately, on the personal biases of whoever is managing the area. Consequently, it is critical to set some objective limits on the types and amounts of change that are either desirable or acceptable. A first task for management, as was mentioned in Chapter 1, is to set limits of acceptable change.

2. Impacts are the inevitable result of recreational use. All forms of outdoor recreation will inevitably lead to some compaction of soils and disturbance of vegetation. Moreover, the fragility of most natural environments is such that very little use causes substantial amounts of impact. The asymptotic, curvilinear nature of the relationship between amount of use and amount of impact is an important, consistent conclusion of impact research. Therefore, it is not realistic to try to eliminate impact unless one is willing to prohibit all use. Instead, management should strive to limit impact. Because low levels of use can cause significant impact, it is particularly important to control the areal extent of use and impact.

3. Impacts exhibit relatively predictable patterns both in space and over time. Impacts are highly concentrated around attractions and recreational facilities (nodes) and along travel routes (linkages) (Manning 1979). Although impacts can be severe in these places, they are usually minimal throughout the vast majority of most wildland areas. This is a fortunate situation that can be reinforced through planning and site design. A second pattern is for impact to occur rapidly once an area is opened to recreational use (Marion and Cole 1996). After a few years, further impact is usually minor with one important exception. That exception is the tendency for sites to expand in area as they continue to be used (Cole and Hall 1992). Again, planning and site design should recognize this tendency and move to actively counteract it.

4. Impacts vary greatly between environments, along with differences in the tolerance of each environment. Both resistance and resilience vary. Most environments have both low resistance and low resilience. Consequently, impact occurs rapidly and recovery is slow. However, all combinations exist, except perhaps for high resistance and high resilience. These differences can be used to advantage in planning, such that the negative consequences of recreation use are minimized.

5. Impacts vary greatly with type of use and mode of travel. This was discussed in depth in Chapter 9. Both the nature and magnitude of impact vary with type of use.

For example, horses cause more trail erosion than hikers (DeLuca, Patterson, Freimund, and Cole in press); their need to graze will also cause types of impact not found in areas without horse use. From this it follows that the greatest impact should occur where the greatest mix of different uses occurs. This suggests that there are likely to be situations where zoning is a good strategy for minimizing impact.

6. All elements of the environment are interrelated. This is perhaps the highest principle in ecology. Everything is connected to everything else. This applies not only to the natural environment but to the recreationists in the environment as well. Actions taken to control one type of impact can affect another type of impact or another place. Moreover, actions taken to reduce impacts can affect user experiences and vice versa.

In summary, it is critical to establish specific objectives—limits of acceptable change—to determine at what level impact becomes a problem demanding management action. Because impact varies with amount of use, type of use, and environment, these are the variables that management can change to control impact. Finally, because everything is connected to everything else, it is important to consider the likely consequences of any potential management action to all other parts of the system—to visitor experiences as well as to resource conditions.

PLANNING FOR MANAGEMENT

A number of approaches have been taken to plan for recreational use in such a way that undesirable impact is minimized. Two planning frameworks that we find particularly useful are the Recreation Opportunity Spectrum (ROS) and the Limits of Acceptable Change (LAC) and related planning processes.

Recreation Opportunity Spectrum

Different recreationists participate in various activities in different physical-biological-social-managerial settings in order to realize various experiences. For example, one recreationist may choose camping (activity) in the natural, low-human-density, minimally restricted environment of a remote backcountry area (setting) to contemplate nature and get away from urban life for a while (experience); another may choose downhill skiing in a developed, high-density environment to seek thrills and meet people. The same person may desire each of these recreational opportunities at different times. Because many different recreational opportunities are both possible and legitimate, how does a manager decide what opportunities should be provided where?

Given the variety of legitimate tastes that exist, it is clear that a diversity of recreational opportunities have to be provided. Not every area can offer a wide range of opportunities, but diversity should be promoted and, at least regionally, a wide range should be provided. Written expression of the need for a variety of outdoor recreation options can be found as early as the late nineteenth-century writings of Fredrick L.

Olmstead and is apparent in the writings of many influential thinkers within the federal land-managing agencies—Arthur Carhart, Aldo Leopold, and Robert Marshall (Driver, Brown, Stankey, and Gregoire 1987). The early outdoor recreation educator J. V. K. Wagar (1951) called for a system of recreation lands ranging “from the flower pot at the window to the wilderness . . . to appeal to varying abilities” and to meet different purposes.

Although the concept of a recreation opportunity spectrum has been long recognized, progress in implementing the concept was largely absent until the late 1970s. At that time, several teams of researchers proposed a logical framework for systematically planning for the provision of a diversity of recreational opportunities—the Recreation Opportunity Spectrum (ROS). The basic intent of the ROS framework was to define different types of recreation settings, each capable of providing a different type of recreational experience. This was to be accomplished by describing broad classes of recreation opportunities, identifying indicators of those opportunities, and defining specific standards for each indicator that make it possible to distinguish between different opportunities (Driver, Brown, Stankey, and Gregoire 1987).

The rationale behind the indicators that were selected derives from the definition of a recreation opportunity as an opportunity to engage in a preferred activity (e.g., kayaking), in a preferred setting (e.g., a remote river), to realize desired experiences (e.g., physical exercise and challenge). Consequently, the three components of an ROS-defined recreation opportunity are *activities*, *settings*, and *experiences*. Moreover, early work showed that it was useful to define three different types of setting attributes. The physical setting includes biophysical resources, cultural-historical resources, as well as recent relatively permanent human structures such as roads and dams. The social setting includes the number of other people present, their behaviors, and the recreational activities they participate in. The managerial setting refers to level of development in the area, on-site presence of management, services provided, and rules and regulations (Driver, Brown, Stankey, and Gregoire 1987). A diversity of recreational opportunities can be offered simply by providing various combinations of activity, experience, physical setting, social setting, and managerial setting opportunities.

Attempts to empirically validate the relationship between activities, experiences, and environmental settings that provides the theoretical foundation of the ROS have produced mixed results (Virden and Knopf 1989; Yuan and McEwen 1989). Nevertheless, the framework is widely used and has become rather highly developed and procedurally elaborate. The detailed procedures of the ROS have been adopted as part of the basic planning processes of the Forest Service and the Bureau of Land Management. Basic ROS concepts have been applied more broadly in the United States and around the world. In their formal implementation of the ROS, the Forest Service recognizes six opportunity classes, ranging from urban to primitive. Each is defined in terms of setting characteristics—managerial regimentation, interaction among user groups, evidence of human modification of the environment, size or extent of the area of opportunity, and remoteness (Table 1). In this book we are primarily concerned with the four more primitive types, not the rural or urban setting classes.

TABLE 1. Appropriate Setting Descriptions for Each of the Six Classes in the Recreational Opportunity Spectrum

Recreational Opportunity Spectrum Class					
Primitive	Semiprimitive Nonmotorized	Semiprimitive Motorized	Roaded Natural	Rural	Urban
Area is characterized by essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.	Area is characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is not permitted.	Area is characterized by a predominantly natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is permitted.	Area is characterized by predominantly natural-appearing environments with moderate evidences of the sights and sounds of humans. Such evidences usually harmonize with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional	Area is characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities	Area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans, on-site, are predominant. Large numbers of users can be expected, both on-site and in nearby areas.

TABLE 1. (Continued)

Recreational Opportunity Spectrum Class					
Primitive	Semiprimitive Nonmotorized	Semiprimitive Motorized	Roaded Natural	Rural	Urban
			motorized use is provided for in construction standards and design of facilities.	are often provided for special activities. Moderate densities are provided far away from developed sites. Facilities for intensified motorized use and parking are available.	Facilities for highly intensified motor use and parking are available, with forms of mass transit often available to carry people throughout the site.

Source: USDA Forest Service. 1982. *ROS Users Guide*.

The ROS framework can be used for at least three purposes. Its most common use is as a means of inventorying current recreational opportunities. The Forest Service's *ROS Users Guide* (USDA Forest Service 1982), for example, provides elaborate instructions about how to evaluate each of the five setting characteristics to arrive at one of the six ROS classes described in Table 1. These classes can be drawn on maps, providing both site-specific details and a general overview of the supply of recreational opportunities.

The framework is also useful in developing management prescriptions for wildlands. Each ROS class has distinct objectives—in terms of appropriate setting characteristics, activities, and appropriate management techniques. Toward the primitive end of the opportunity spectrum, recreational impacts are less acceptable and objectives are more likely to stress low-impact conditions. At the same time, regimentation is more undesirable at the more primitive end of the spectrum. This has important implications for the appropriateness of various management styles. Subtle management techniques are preferable to extensive use of regulation and persuasion. Thus, the recreation opportunity class (or range of classes) provided by any recreation area will determine, to a great extent, both limits of acceptable change for impacts and the most appropriate means of mitigating impact problems.

This also points out why management of impacts is particularly difficult toward the primitive end of the spectrum—in wilderness, for example. Toward that end, impacts are least acceptable but management has the least amount of leeway in using restrictive techniques. Access is also difficult, making enforcement, patrol, and other management activities more troublesome. For all these reasons, management of more primitive wildlands is especially complex and will be discussed in considerable detail in the following chapters.

Limits of Acceptable Change Planning Framework

As discussed in Chapter 1, the focus on recreation carrying capacity, the first concept managers turned to in an attempt to manage recreation impacts, proved to be problematic. The seeming promise of using carrying capacity—that limiting use could solve most management problems and that use limits could be determined by objective factual data—proved false. Instead, limiting use is just one of many alternative management techniques and often is not even among the most effective. Moreover, decisions about appropriate use levels are at least as dependent on subjective evaluations (management objectives) as they are on the descriptions of relationships between amount of use and amount of impact that science can provide (Shelby and Heberlein 1986). Consequently, the latest generation of planning frameworks focus their attention on the formulation of specific management objectives. Substantial progress has been made in establishing objectives that are specific enough to “drive” the recreation management planning process. Instrumental to allowing this progress was the concept of setting limits of acceptable change.

The first clear articulation of the “limits of acceptable change” concept appeared in a graduate student study of impacts on campsites in the Boundary Waters Canoe Area Wilderness. Frissell (1963) concluded that if recreation use is to be allowed,

campsite impact is inevitable and must be accepted. However, this author stated, "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." In other words, there is a conflict between allowing recreation use and preserving natural ecosystems. The key is to define an optimal balance between these two conflicting goals, in which both recreational opportunities and natural ecosystems are compromised to some extent (Cole and Stankey in press). This balance can be expressed as a limit on deterioration (change).

Frissell and Stankey (1972) recognized that this quest for balance between use and protection of quality environments and experiences was similar to the intent behind carrying capacity. Consequently, they proposed the "limits of acceptable change" concept as an alternative model for making decisions about carrying capacity. Their fundamental idea was to focus management on achieving specific objectives, defined as staying within maximum deviations from (1) the "natural range of variation" in ecological conditions and (2) a "pristine wilderness experience." Starting in 1980, a group of Forest Service researchers refined this general concept further and produced a procedural manual, "The Limits of Acceptable Change (LAC) System for Wilderness Planning" (Stankey, Cole, Lucas, Petersen, and Frissell 1985). Conceptually related processes—Visitor Impact Management (VIM) and Visitor Experience and Resource Protection (VERP)—were subsequently developed for use by the National Park Service (Graefe, Kuss, and Vaske 1990; Manning, Lime, and Hof 1996).

The LAC, VIM, and VERP processes all use slightly different terminology and step sequences. However, participants in a 1997 workshop on these processes (McCool and Cole in press) agreed that these processes were conceptually identical and moved to adopt more consistent terminology. They also noted that step sequencing need not be rigidly adhered to and that these processes were largely iterative and circular rather than linear. Consequently, we have chosen to present these planning processes at a broad conceptual level. Those interested in further detail on the steps of the individual processes can refer to the more detailed procedural descriptions mentioned previously.

Figure 1 provides a simple overview of the planning framework each of these processes utilizes. Each process involves stating the conditions management will maintain or allow to occur (how much impact is acceptable), inventorying existing conditions to see how they compare with acceptable conditions, as stated in objectives, and then instituting management actions where existing conditions do not meet objectives. The final step, monitoring, involves periodically returning to the inventory stage of the process.

Set Objectives. It is a relative simple matter to determine the *magnitude* of an impact. Although not perfect, well-developed techniques are available for measuring, in quantitative terms, the increase in bulk density on a recreation site. Using similar techniques, several independent investigators could each determine that bulk density increased, say, 0.10 g/cm^3 . Where disagreement comes is in evaluating the *importance* of this amount of impact. Depending on one's point of view, an increase in compaction of 0.10 g/cm^3 might constitute either disastrous damage or an insignificant change.

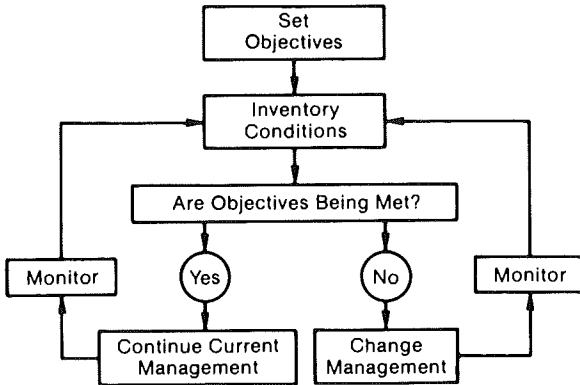


FIGURE 1. A simple planning framework. (Source: D. N. Cole.)

Moreover, it might be highly desirable on a constructed nature trail or totally unacceptable in a remote trailless setting. Only where specific objectives have been established for specific places can one consistently determine whether or not an impact of a given magnitude constitutes a problem that demands management attention.

One might argue that all impacts should be considered problems and aggressively attacked. As mentioned before, however, some impacts are desirable in certain situations. Moreover, all management actions entail costs, both to the visitor and to management. The goal of recreation management planning is to find the optimal balance between use and protection. Given both budgetary constraints and a concern for avoiding unnecessary restriction of recreation use and behavior, it is best to attack not impacts but impact *problems*—situations in which impacts exceed levels specified in objectives.

Objectives could be written to limit every possible type of recreation impact. However, this is not reasonable or even desirable. Fortunately, actions taken to avoid certain impacts are likely also to protect against other types of impact. For example, reducing use to limit campsite disturbance is also likely to reduce wildlife disturbance. Therefore, it may only be necessary to set objectives for a few particularly important and sensitive types of impact. There may also be unique situations, such as for rare or endangered species, for which objectives are also needed. As mentioned before, objectives for dealing with impacts that are not self-limiting are particularly important. Some of the elements for which objectives might be written include trail condition, campsite density and condition, water quality, and wildlife populations and their distribution. Within each of these broad categories it is important to be even more specific. For example, objectives for campsite condition might be written for soil compaction, ground cover condition, tree damage, campsite area, or a combination of these factors depending on the local significance of these impacts.

In LAC terminology, the variables for which objectives are written are called “indicators.” Several authors have listed characteristics of a “good” indicator. Seven of the most desirable characteristics of an indicator are that it be:

1. *Measurable*—quantitative and subject to measurement
2. *Reliable*—capable of being measured precisely by different people
3. *Cost-effective*—capable of being measured using inexpensive equipment and techniques
4. *Significant*—related to impacts that, should they occur, would be considered serious problems
5. *Sensitive*—capable of providing an early warning system, alerting managers to problems while there is still time to correct things
6. *Efficient*—capable of reflecting the condition of more than itself, reducing the number of indicators that must be assessed
7. *Responsive*—related to attributes that are subject to management control

Among the first places where specific objectives were established in order to limit impact was the Bob Marshall Wilderness Area in Montana. This large (more than 1 million acres), remote, and spectacular area has been heavily used by large parties traveling with stock. As a result of a long history of such use, many campsites have been highly impacted. Managers of the area believed that such high levels of impact detracted from the values for which the area was designated as wilderness. Consequently, they decided to limit impact and developed objectives for the area based on (1) a maximum devegetated area on campsites, (2) a maximum number of campsites in any square mile, and (3) maximum amounts of range utilization and specified standards for range condition and trend.

For each of these measures of impact, quantitative objectives (LAC standards) were written. Moreover, to incorporate diversity into the system, as discussed in the previous section on ROS, these quantitative limits vary between different zones established within the wilderness (Table 2). Currently, the area contains considerable diversity. Some areas are pristine and trailless, and others are heavily used and show considerable evidence of disturbance. To preserve, enhance, and, in some cases, redirect this diversity, the Bob Marshall Wilderness has been divided into four zones. In the most pristine zone (I) proposed objectives state that no campsite will contain more than 100 ft² of devegetated area; there will be no more than one campsite in any square mile; range utilization will not exceed 20 percent; range condition will be excellent; and range trend will be static or improving. If these objectives are met, environmental impact in this zone will be low. Elsewhere, more impact is tolerated. For example, the allowable number of campsites in any square mile increases to two, three, and six in the three successively less primitive zones. The allowable devegetated area on campsites increases to 500, 1000, and 2000 ft².

In the first application of the VERP process, to Arches National Park, eight different zones were established that allowed visitor use (National Park Service 1995). The zones ranged from the primitive zone with no developed facilities, very low use, and minimal impact, to a developed zone that contains most of the developed visitor facilities. No recreation use was allowed in a ninth zone, the sensitive resource protection zone. Eight different indicators of resource impact were developed, of which

TABLE 2. LAC Standards for Resource Indicators in the Bob Marshall Wilderness

Indicator	Zone I	Zone II	Zone III	Zone IV
Devegetated area on any campsite	Maximum of 100 ft ²	Maximum of 500 ft ²	Maximum of 1000 ft ²	Maximum of 2000 ft ²
Number of campsites per square mile	Maximum of 1	Maximum of 2	Maximum of 3	Maximum of 6
Forage utilization	Maximum of 20%	Maximum of 20%	Maximum of 40%	Maximum of 40%
Range trend	Static or improving	Static or improving	Static or improving	Improving
Range condition	Excellent	Excellent	Generally good or better	Generally good

three were considered of primary importance. Both the indicators used and the standards for those indicators varied among zones. The condition of cryptobiotic crusts was the indicator to be monitored in most of the zones. The maximum acceptable number of soil samples with a soil crust condition index of less than 4 (no lichens or mosses left in the crust but cyanobacteria still present) ranged from 5 percent in the hiker zone to 30 percent in the pedestrian and motorized sight-seeing zones. In the very lightly used backcountry and primitive zones, this indicator was replaced by a measure of the density of social trails. In the semiprimitive motorized zone, the number of places where vehicle tracks widened beyond two simple tracks was the indicator to be used. Finally, in the developed zone, where high levels of resource impact are accepted, no resource indicators are monitored. This illustrates how varying indicators between zones enables variation in the kinds of impact that are of concern to be incorporated into the planning process.

Finally, it is worth reiterating that objectives (LAC standards) are judgments—subjective evaluations of the most appropriate compromise between use and resource protection. Managers have frequently looked to scientists to tell them where standards should be set, perhaps hoping to avoid having to make hard subjective decisions. Some scientists have encouraged this tendency by representing their results as indicative of where standards should be set (e.g., Shelby, Vaske, and Donnelly 1996). Although there are legitimate differences of opinion about the degree to which empirical data can be directly translated into LAC standards, it is our opinion that standards should be *informed by science* rather than *derived from science*. Empirical data can be used to describe the costs and benefits of alternative LAC standards. However, it remains for a manager to decide the optimal trade-off.

Inventory Conditions. Once objectives have been established, it is time to go out and inventory conditions on the ground to see where the objectives are and are not being met. In many cases some initial inventory will be necessary before realistic objectives can be set. It does not do any good to set objectives that are so stringent that they can

never possibly be met. It also does little good to set objectives so lax that their attainment does little to avoid impact problems. Thus, it is helpful to do a little sampling of conditions, before quantitative objectives are established, to help set meaningful but realistic objectives.

Inventorying is the first phase of a long-term monitoring program. Monitoring is merely periodically repeating the inventory and comparing current conditions to both objectives and previous inventory data. Monitoring is covered in much more detail in Chapter 11. At this stage, two points should be made. First, the most important things to monitor (inventory) are the elements addressed in objectives; other data can be collected, but first priority must go to elements addressed in objectives. For example, in the Bob Marshall Wilderness, objectives dictate that managers must collect information on campsite devegetated area. They are also collecting information on size of the campsite, but this is less important because it is not specified in the objectives. Second, inventory must be conducted in an objective and systematic fashion. Techniques must be well documented so that successive inventories are comparable.

Compare Conditions to Objectives. After the inventory is completed, it is a relatively simple matter to identify places where conditions are not being met. These are problem areas that demand management attention. It may also be possible to identify places where conditions currently are in line with objectives, but there is reason to believe they may not be in the near future. This ability to predict will improve greatly as monitoring progresses and some trend data become available. Places where the trend is downhill may also require management attention. Even in places where objectives are being met, it may be appropriate to change or strengthen management if it is not too burdensome to the visitor. For example, promoting low-impact camping techniques and a pack-it-in, pack-it-out litter policy are desirable even where campsite impact and litter are not problems. Such programs are not burdensome to visitors. However, greatly restricting numbers of users or prohibiting certain activities is hard to justify if objectives are being met.

There are usually a number of alternative management actions that can be taken to mitigate any single problem. In the following section, we discuss how to decide on an appropriate course of action. Chapters 12 and 13 will provide specifics on alternative techniques and some of their pros and cons.

MANAGEMENT OF PROBLEMS

Although our concern is with management of ecological impacts, it is important to remember that an equal concern must be given to the provision of quality recreational experiences. The simplest, most effective means of minimizing recreational impact is to prohibit all use. This obviously defeats the purpose of a recreation area. It is not possible to maximize both provision of recreational opportunities and protection from environmental impacts; a compromise is always necessary. In thinking about how to manage impact, then, it is important also to consider how any action is likely to affect the recreational experience.

Given many alternative courses of action, it is imperative that managers carefully consider all possible actions. Too often there is a tendency to select techniques that are familiar or administratively expedient but not ideally suited to the situation at hand. Among the factors to consider, in trying to decide on a course of action, are effectiveness, costs to administer, costs to the visitor, and likely side effects. Supporting actions are often necessary if a given course of action is to be successful. These should be considered as well. Ultimately, the best programs will consist of carefully selected sets of actions that maximize effectiveness and minimize costs. Attacking a problem from several different angles is often the best course to follow. This is why it is worth considering the strategic purpose of actions.

Strategic Purpose

As we noted in the chapters on factors that influence impact, amount of impact is a function of amount of use, type of use, visitor behavior, use distribution, timing of use, and environment. Each of these variables can be manipulated by management and, therefore, offers a unique strategic approach to controlling impact problems. Wagar (1964) was the first to recognize that there were several strategies available for dealing with recreation impact problems. Subsequent papers by Manning (1979), Peterson and Lime (1979), and Cole, Peterson, and Lucas (1987) have provided more comprehensive and detailed typologies of strategic purpose.

The most obvious—but seldom the most desirable—approach to reducing impact is to reduce use. Everything else being equal, less use should cause less impact. However, one party that builds a campfire or that travels with horses can cause more impact than several parties of backpackers using a portable stove. Another approach to reducing impact, then, is to leave amount of use constant but reduce the amount of impact each visitor causes. This can be accomplished in several ways:

1. *Use Dispersal.* Use can be spread out, so that areas of concentrated use and impact are avoided.
2. *Use Concentration.* Conversely, use can be concentrated in space so that only a small proportion of the resource is altered.
3. *Type of Use.* Type of use can be managed in such a way that particularly destructive uses are minimized.
4. *Visitor Behavior.* Visitors can be persuaded to behave in ways that minimize impact.
5. *Timing of Use.* Visitor use can be prohibited or discouraged during seasons or at times when resources are particularly vulnerable to disturbance.
6. *Site Location.* Use can be directed to particularly durable places that are able to tolerate heavy use.
7. *Site Hardening or Shielding.* A site's capacity to tolerate use can be increased by either hardening it or shielding it from impact.

All of these strategies attack the causes of impact problems. Another strategy is to attack the symptoms through site maintenance and rehabilitation. Generally, this approach is costly and never ending, so it should be complemented with attacks on the causes. However, there are situations in which attacking symptoms must be the core of a management program. A good example is dealing with human waste in areas of concentrated use. Use can be concentrated, and the resource can be shielded by building outhouses and persuading visitors to use them. However, there is little alternative to establishing a flushing system, a composting system, or hauling the waste out. Examples of how each of these strategies might be employed in a program to reduce impact on campsites are provided in Table 3.

Most of these strategies can be implemented through management of visitors or through site manipulation, the subjects of Chapters 12 and 13, respectively. For example, use concentration can be promoted either by requiring visitors to camp at designated sites (visitor management) or by using railings or rocks and shrubbery to confine traffic flow (site manipulation). Only the site hardening/shielding and site maintenance/rehabilitation strategies are entirely within the domain of site manipulation. Distinctions between visitor and site management are not as clearcut as is often assumed, because site manipulation is often done for the purpose of managing visitors. A useful general principle is that the best management approach will utilize a combination of visitor and site management, as well as a combination of strategic approaches.

A final important point about strategies is that any single strategy can be used to attack a number of different problems. This is a reflection of the interrelatedness of everything. The problem is that some of the effects of implementing any course

TABLE 3. Strategies and Actions for Reducing Impact on Campsites

Strategy	Possible Actions
Reduce amount of use	Limit number of parties entering the area.
Reduce per capita impact	
Use dispersal	Persuade parties to avoid camping on highly impacted campsites.
Use concentration	Prohibit camping anywhere except on designated sites.
Type of use	Prohibit horse groups in camp.
Visitor behavior	Teach low-impact camping techniques.
Timing of use	Discourage camping when soils are water-saturated.
Site location	Teach parties to choose resistant sites for camping.
Site hardening/shielding	Build wooden tent pads on campsites.
Rehabilitation	Close and revegetate damaged campsites.

of action may be undesirable. As Manning (1979) puts it, "The various strategic uses of park management tools should be explicitly recognized before they are implemented so as to gain multiple benefits where possible and avoid unwanted side effects where potential." Cole, Petersen, and Lucas (1987) have developed a "troubleshooting" guide that lists many management strategies and tactics that can be used to attack different types of recreation management problems in wilderness.

Types of Undesirable Visitor Actions

Management response to impacts should vary between types of undesirable visitor behavior. Lucas (Hendee, Stankey, and Lucas 1990) recognized five types of visitor actions:

1. Illegal actions with adverse impacts
2. Careless or thoughtless violations of regulations with adverse impacts
3. Unskilled actions with adverse impacts
4. Uninformed behavior that intensifies use impacts
5. Unavoidable minimum impacts

Examples and appropriate management responses to each of these types are presented in Table 4. The important point here is that different responses are required for different types of users. What is necessary in one place may be overkill in another, where the users are more skilled or more likely to obey regulations.

TABLE 4. Types of Visitor Actions and Appropriate Management Responses

Type of Visitor Action	Example	Management Response
Illegal actions	Motorcycle violation	Law enforcement
Careless actions	Littering, nuisance activity (e.g., shouting)	Persuasion, education about impacts, rule enforcement
Unskilled actions	Ditching tent	Primarily education about low-impact use practices, some rule enforcement
Uninformed actions	Concentrated use	Education-information
Unavoidable impacts	Human waste, physical impact of even careful use	Reduction of use levels to limit unavoidable impacts; relocation of use to more durable site

Source: Hendee, Stankey, and Lucas 1990.

Types of Management Approaches

Traditionally, management actions have been classified as being either direct or indirect (Gilbert, Peterson, and Lime 1972). Direct management attacks human behavior directly, usually through regulation. An example is allowing camping in only one area. The visitor must either camp there or break the law; free choice is extremely limited. Indirect management attacks decision-making factors in an attempt to indirectly influence rather than force behavior. Visitors retain the freedom to choose their course of action. This is usually accomplished through information, persuasion, or site manipulation. For example, visitors can be told that a certain area (where managers want them to camp) is the nicest place to camp; visitors can be asked to camp in that area; or facilities can be built in the area to attract visitors.

It is commonly stated that indirect management is preferable to direct management and should be tried first. Much of the debate about whether direct or indirect approaches are preferable revolves around considerations of each approach's effectiveness and the burden each approach places on visitors. It is commonly assumed that direct approaches are more effective and also carry more visitor cost. Both of these assumptions are oversimplified and can be misleading. For example, shortcutting switchbacks continues even in places where it has been prohibited. Trail design, such that shortcutting is extremely difficult, an indirect approach, can be more effective.

There are also cases in which direct techniques are less costly to visitors than indirect techniques. For example, we would prefer an existing regulation prohibiting camping in a certain area to be made present to us before entering the area (direct regulation), rather than having a ranger walk into our camp and ask us to move out of a fragile or overused area (indirect persuasion).

The distinction between direct and indirect management was useful in focusing attention on the burden that different management approaches place on the visitor and challenging managers to keep such "heavy-handed" management to a minimum. However, it is now clear that the one-dimensional concept of a direct-indirect continuum is oversimplified (McCool and Christensen 1996). Moreover, the popularity of the notion that indirect techniques are preferable to direct techniques has paralyzed many management programs, because managers have been unwilling to implement direct management actions even if they are the only effective means of dealing with impacts (Cole 1995). Instead of considering techniques as they are arrayed on a direct-indirect continuum, we suggest that managers evaluate techniques in terms of their likely effectiveness and the burden they place on visitors—how heavy-handed the action is.

Effectiveness. Effectiveness should probably be the initial criterion used to identify potential management actions. It is pointless to consider techniques that are not likely to correct impact problems in a reasonable amount of time. However, there can be considerable debate about what constitutes a "reasonable" amount of time. Where significant problems have already occurred, we suggest selecting techniques that are likely to be effective within at least a few years. Where the concern is a problem that

might occur in the future, techniques that require more time to be effective (e.g., visitor education) are also appropriate. Given the difficulty and expense of restoring sites—once damage has occurred—it is best to err on the side of selecting a technique that is certain to be effective. However, it is not necessary to select the *most* effective technique, if a slightly less effective technique carries much less visitor burden. Chapters 12 and 13 contain considerable discussion of the effectiveness of different management techniques, as do Cole, Petersen, and Lucas (1987) and McCool and Christensen (1996).

Visitor Burden. Cole, Petersen, and Lucas (1987) identify five different dimensions that together determine how heavy-handed a management action is (Table 5). Freedom of choice is the dimension most closely associated with the traditional direct versus indirect distinction. The distinction related to freedom of choice is between regulation and manipulation of human behavior. As Lucas (1982) points out, recreation and regulations are inherently contradictory because freedom and spontaneity lie at the core of most wildland recreational pursuits. Regulations are particularly undesirable toward the primitive end of the recreational opportunity spectrum, where regimentation is supposed to be low. An objective of recreation management in wilderness, for example, is to provide opportunities for an “unconfined type of recreation.” Freedom of choice is important and should be preserved where possible.

There are situations, however, where regulation plays an important and legitimate role. Several such situations mentioned by Lucas (1983) include safety (e.g., regulations keeping motorboats out of swimming areas), reducing interference with other visitors (e.g., regulations requiring quiet after 10:00 P.M.), and situations in which a few individuals use more than their share of recreation resources (e.g., limits on numbers of fish or game). Generally, regulations are appropriate where it is imperative that most visitors comply with a regulation and where there is law enforcement available to back it up. Where regulations are instituted, it is important to:

TABLE 5. Factors That Influence the Visitor Burden Imposed by Management Actions

Factor	High Burden	Low Burden
Freedom of choice	Regulate behavior	Influence behavior
Subtlety	Visitors are aware they are being managed	Visitors are not aware they are being managed
Where management occurs	Activities controlled on-site	On-site activities not controlled
When management occurs	Visitors aware of actions only after their arrival	Visitors aware of actions during planning of trip
Number of visitors affected	Many visitors affected	Few visitors affected
Importance of activity that is forgone	Highly important activity	Unimportant activity

1. *Explain reasons for regulations.* This should help to improve visitor compliance. Visitors are more inclined to respect rules and to be hassled less by them if they recognize that they are necessary.
2. *Be sure that visitors understand how they are expected to behave.* In some cases visitors may be left unaware of regulations, or the rules may be ambiguous. This is likely to reduce compliance and increase confusion and frustration.
3. *Enforce regulations.* It is not fair to law-abiding visitors to not enforce regulations. If enforcement is impossible, it is probably better just to ask people to behave in a certain manner.
4. *Regulate at the minimum level possible.* Do not overattack the problem with restrictions that unnecessarily burden visitors.

There may be situations in which the same objectives can be accomplished without establishing a regulation. Persuasion—asking visitors not to build campfires, for example—is usually preferable to prohibiting campfires. Effectiveness may be comparable, and visitors retain final choice. Even with persuasion, however, visitors are still likely to feel pressured to conform to what the manager wants, and this is a burden. Persuasive approaches lack subtlety, and if the contact between management and the visitor occurs within the recreation area, it may be even more obtrusive and disturbing than a regulation. This can be a particular problem when conscientious visitors give up something important to them, such as campfires, and have to watch unconscientious visitors enjoy them.

Perhaps as important as freedom of choice is subtlety or unobtrusiveness. Subtlety refers to the extent to which a visitor is aware of being managed. The example of a ranger walking into camp and asking a camper not to build a fire is an extreme example of an obtrusive manipulative action, not substantially preferable to a regulation prohibiting campfires. Freedom of choice is retained, but the burden of guilt, should the camper choose to defy the wishes of the ranger, makes this of little importance. Education/information, without telling visitors what they should do, and physical manipulation are more subtle approaches to management. For example, in trying to keep people from camping in a particular place, such as on a lakeshore, visitors can be educated about the fragility of lakeshores, or trails can be developed that avoid lakeshores and lead to other places where attractive campsites are located. These actions can be effective and would avoid the loss of freedom that comes with regulation. It is subtlety, as much as lack of regulation, that is the preferred approach to management of recreation use.

The third and fourth considerations are where and when management occurs. Particularly toward the primitive end of the opportunity spectrum, it is preferable to regulate or influence behavior outside of rather than inside the recreation area. This allows the visitor to adjust to restrictions early and not to be encumbered greatly while engaging in recreational activities. For example, where entry to an area is controlled, it is preferable to limit trailhead entry rather than limit movement within the area. In our ranger example, it would be more acceptable to be asked,

before entering the area, not to build a fire. The best time to communicate restrictions or attempt to influence behavior is when visitors are in the planning phase of their trip. At this stage they can change their plans if the impact of management programs is unacceptable to them, and they have time to accept and adjust to restrictions.

Two final concerns are with the number of visitors affected by an action and the importance of the freedoms visitors are asked or required to forgo. For the majority of backcountry users, a regulation limiting party size is much less bothersome than being asked not to build a campfire. This follows from the fact that fewer parties are affected by a party size limit. Similarly, asking visitors to pack out their litter should be less costly than asking them not to build campfires. Most visitors place more importance on being able to have a fire than on being able to leave their trash, so denial of the campfire is more burdensome. The cumulative weight of a number of restrictions must also be considered. Many people have said that reducing use should be the last option a manager exercises. It may be much worse, however, to keep visitors from doing many of the things they want to do, than it would be to occasionally deny them access to the area (Cole 1995).

In sum, it is a complicated matter to assess the cost of an action to visitors. Everything else being equal—which it never is—preferred approaches are those that are nonregulatory and subtle and that confront the visitor outside the area during the planning phase of the trip. Few actions combine all of these desirable elements. where other combinations exist, managers will need to balance pros and cons. All of these concerns have to be weighed against an evaluation of likely effectiveness.

Toward the primitive end of the opportunity spectrum, subtlety is probably the most important concern. It is not possible, however, to make simple rules about whether or not an internal nonregulatory approach is preferable to an external regulatory approach. Toward the more developed end of the spectrum, regulation and nonsubtle approaches are to be expected. The important concerns here are usually the number of visitors affected and the importance of the freedoms visitors are asked to forgo. In all areas it is important to maximize freedom and spontaneity because these are critical elements of most wildland recreational experiences.

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