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Managing Wilderness Recreation Use: Common Problems and Potential Solutions

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GENERAL SUMMARY

This report summarizes information on alternative management tactics available for dealing with common wilderness recreation problems. The first section of the report describes eight basic strategies for attacking problems: reduce use of the entire wilderness, reduce use of problem areas, modify the location of use within problem areas, modify the timing of use, modify type of use and visitor behavior, modify visitor expectations, increase the resistance of the resource, and maintain or rehabilitate the resource.

The second section describes the nature of general problems resulting from recreational use of wilderness. In order of frequency, the most common problems are trail deterioration, campsite deterioration, litter, crowding, packstock impact, human waste disposal, impacts on wildlife, user conflicts, and water pollution. For each of these problems, strategies and tactics with the potential to substantially alleviate problems are listed. Tactics are specific approaches to implementing a strategy. A total of 37 tactics have been grouped according to one or another of the eight strategic purposes.

The bulk of the report describes each of these tactics. For each tactic the following topics are discussed: the purpose of the tactic; a description of how it can be used to solve specific problems; the extent of its current usage; estimated costs of implementation, both to visitors and management; likely effectiveness; comments on other considerations, particularly probable side effects; and other sources of information.

Our hope is that this report will serve as a "trouble-shooting" guide. When faced with a specific problem, managers can turn to the list of primary tactics for dealing with each problem. The pros and cons of each of these can be reviewed in the section that provides detailed discussions of tactics. Selection of a tactic or, more often, a combination of tactics can then be made on the basis of information that is as complete as we could assemble.

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INTRODUCTION

The Wilderness Act of 1964 established within the public lands of the United States a system of wildernesses to be managed so as to preserve both natural ecosystems and opportunities for wilderness experiences. Increased recreational use of wilderness has created many situations in which these objectives have been compromised. Where objectives are not being met, managers must seek out means of correcting these problem situations. Managers now have more than 20 years of experience in dealing with some general problems common to the entire wilderness system (Washburne and Cole 1983). Research into such problems and potential solutions to them has also accumulated over this period.

An extensive literature is now available on how to develop programs for managing recreational use. Peterson and Lime (1979) present a useful general framework for solving visitor management problems, and Lucas (1982) provides a step-by-step procedure for evaluating alternative approaches to problem solving, with particular emphasis on how to avoid unnecessary regulations. Both papers stress clearly identifying problems and carefully evaluating all potential solutions to problems. Stankey and others (1985) describe the Limits of Acceptable Change (LAC) planning system, a formalized framework for identifying problems and management responses to problems.

After more than 20 years of research and experience with managing wilderness, it seems timely to synthesize wilderness management experience, condense it, and make it readily accessible to managers currently struggling with common problems. Gilbert and others (1972) provided a list of some alternative wilderness management techniques. Hendee and others (1978) modified this table and described pros and cons of some of these techniques. But there is no detailed compilation of current knowledge about the appropriateness, effectiveness, and advantages and disadvantages of alternative management tactics. This report is an attempt to fill this gap.

PURPOSE AND ORGANIZATION

This report summarizes information useful in considering management approaches to mitigating common wilderness problems caused by recreational use. The objective of the report is to provide a "troubleshooting" guide that will aid in the selection of the most effective and efficient means of dealing with management problems. This guide shows managers faced with a specific problem-say, campsite deterioration-an array of approaches for dealing with the problem along with the pros and cons of each approach.

This report is concerned with problems caused by recreational use of wilderness. Recreation is just one of many wilderness values, but recreational use has the potential to severely compromise other values. Therefore, management of recreation is critical. Although not dealt with here, other uses of wilderness must also be managed to avoid compromise of recreation and other wilderness values.

The organization of this report is as follows: The first section discusses strategies and tactics for dealing with problems. Strategies are broad, conceptual approaches to management (Manning 1979); they attack the basic causes of problems. Tactics are the specific means or tools available for implementing a strategy; generally there are numerous tactics available to accomplish a strategy. Moreover, several strategies and tactics can, and often should, be used to deal with most problems.

The second section describes common recreation-related problems in wilderness and their primary causes. Many of the common problems are subdivided into distinct subproblems that require differing management approaches. The most important strategies and tactics for attacking the primary causes of each subproblem are listed. Managers faced with a specific problem-such as visitor conflict-can turn to the visitor conflict portion of this section to find a list of the most important tactics for dealing with this problem.

The final section (the bulk of the report) discusses the pros and cons of the 37 tactics we have identified. This represents as complete a list of alternative techniques as, we could devise. We have included some tactics, such as charging entrance fees, even though current policies may prevent managers from using them. Other tactics, such as providing facilities, raise questions of appropriateness in wilderness. These issues are considered in the section that describes each tactic.

For each tactic, the following topics are discussed: the purpose of the tactic; a description of how the tactic can be used to solve specific problems; the extent of its current usage; costs of implementation, both to management and to visitors; likely effectiveness; comments on other considerations, particularly likely side effects; and sources of further information. The content of each source of information is described in brief annotations after each reference at the end of the paper.

One of our intents is to highlight the secondary effects of implementing each tactic. Most actions taken to solve a specific problem in a specific place will affect other places and may cause unexpected problems. We believe it is particularly important to consider and plan for secondary effects. There are also many situations where one tactic will be more effective if supported by other tactics. We stress situations where combinations of techniques-rather than just one technique-are likely to be particularly effective.

Our hope is that this report will provide a trouble-shooting guide that managers can turn to when faced with a specific problem, or when an existing problem requires a new approach. Although personal preference must enter into such a reference, we have attempted to minimize bias by reporting the range of existing opinions where controversy exists and by soliciting comments from experienced managers, researchers, and visitors. When choosing tactics one must consider local conditions. This guide cannot identify "best" solutions that are universally applicable across diverse wilderness resources and recreational use situations. Final decisions on tactics remain the responsibility of the resource manager, as they should. But the guide can highlight the wide variety of potential solutions available and the advantages and disadvantages of each option. This should make final decisions more informed.

HOW TO USE THIS GUIDE

We suggest using the guide within the following decision-making process:

1. Clearly identify and document the problem, deciding which category of problem or subproblem it fits (see pages 4-8 for a discussion of problems).
2. Identify the strategies and tactics available for dealing with the problem or subproblem (strategies are discussed, in general, on pages 2-4; tactics are listed under each subproblem on pages 9-15).
3. Read the discussions of each of these tactics (see pages 16-54 for discussions of each tactic).
4. Decide. on the set of tactics that appears most appropriate. Choose strategies that attack the primary causes of the specific problem and tactics that do not conflict with management objectives, that are realistic given the visitor use, environment, and management situation, and that minimize costs to visitors and avoid or reduce unwanted side effects.
5. Query managers who have experience with these tactics; ask how well the tactics work and pick up hints on how best to implement each tactic. Although dated, wilderneses practicing most of these tactics can be found in the appendix of Washburne and Cole (1983).
6. Prepare specific action plans to implement tactics.
7. Implement action plans.
8. Monitor how effectively the selected tactics deal with problems and modify them as necessary. This is why the documentation in step 1 is critical.

This guide is most useful in the early steps pf this decision-making process. Managers must still decide on the most appropriate courses of action.

STRATEGIES FOR SOLVING PROBLEMS

A number of strategies for attacking recreation problems have been identified (Wagar 1964; Manning 1979). The term "strategy" refers to broad, general approaches to management. Although other arrangements are possible, we have grouped all 37 management tactics into eight basic strategies.

I. Reduce Use of the Entire Wilderness-This strategy is associated with the notion that each area has a carrying capacity. The idea behind this strategy is that adverse impacts on ecosystems and visitor experiences result from excessive use and can be mitigated by reducing use. With this strategy, amount of use is controlled, but distribution of use is not.

II. Reduce Use of Problem Areas-This strategy is based on recognition that in most wildernesses problems occur only in a few "problem areas"-lake basins, drainages, or other large destination areas. Use of these problem areas is reduced without necessarily reducing use of the entire wilderness. Usually some of the traffic in problem areas is moved to places with fewer problems. This strategy has been called the use-dispersal strategy.

Amount of use is only one of several factors that influence where problems occur. Other factors include the location, type, and timing of use. Consequently, there are a number of strategies for reducing per capita impact. The following four strategies involve reducing the potential impact a visitor can cause through management of visitors:

III. **Modify the Location of Use Within Problem Areas-** Use can be shifted to durable sites, it can be locally dispersed so that crowding and conflict are minimized, and it can be concentrated on a few sites so the area impacted is minimized. In contrast to strategy II, techniques under this strategy are implemented in order to influence how use is distributed within larger problem areas. For example, in response to problems at a popular lake basin, managers may try to either reduce use of the basin (strategy II) or control where use occurs within the basin (strategy III)-for example, on designated sites only, away from lakes, in forests rather than meadows, off of highly impacted sites, and so on.

IV. Modify the Timing of Use- The fragility of the environment varies with the time of year. In addition, certain times of the year and week are more popular than others, so crowding problems are more severe. Use can be shifted to times when it is least likely to cause impact to either the environment or other visitors.

V. Modify Type of Use and Visitor- Large parties and those with stock and pets have more potential for causing problems than small parties without stock and pets. Of even more importance, parties that do not practice low-impact behavior will cause more problems than other parties. Both type of use and behavior can be modified so that the use that does occur is less likely to cause problems.

VI. Modify Visitor Expectations- The severity of visitor experience-related problems is often influenced by the expectations users have about their likely experience

(Manning 1985). For example, backpackers tend to be less bothered by stock parties if they expect to encounter them and accept them as an appropriate type of visitor in wilderness. Similarly, encountering a large number of other parties is more acceptable if such encounters are expected. Expectations can be modified by informing visitors of appropriate wilderness uses and the types of conditions they are likely to encounter.

The final two strategies involve resource management, as opposed to visitor management:

VII. Increase the Resistance of the Resource-In addition to directing use to naturally durable sites-strategy III-managers can also artificially increase the resistance of the resource by either strengthening (hardening) it or shielding it from impact. These two options are related but involve different levels of resource manipulation. Shielding involves separating the resource from the visitors causing the problem; corduroy trails are a good example. With shielding, human modification is obvious, but the resource can remain essentially unaltered. Strengthening involves changing the resource to make it more durable; in this case natural conditions are being purposely altered by management. The most common examples of strengthening in wilderness are many of the techniques used to create a graded, compacted, erosion-resistant trail tread.

VIII. Maintain or Rehabilitate the Resource- This strategy involves treating symptoms rather than attacking the cause of problems. Impacted locations such as trails and campsites can be maintained or rehabilitated. Other problems, such as litter and human waste, can be treated by removing them from the wilderness.

Under each strategy there are a number of more specific management tactics that can be applied in attempts to solve problems (table 1). The bulk of this report (pages 16-54) discusses these 37 tactics. We have chosen to organize techniques by strategic purpose because this focuses attention on **why** the action is being taken. As is discussed in the next section, the seriousness of most problems is influenced by a small number of factors, such

Table l-Strategies and tactics for wilderness management

I.	REDUCE USE OF THE ENTIRE WILDERNESS
1.	Limit number of visitors in the entire wilderness
2.	Limit length of stay in the entire wilderness
3.	Encourage use of other areas
4.	Require certain skills and/or equipment
5.	Charge a flat visitor fee
6.	Make access more difficult throughout the entire wilderness
II.	REDUCE USE OF PROBLEM AREAS
7.	Inform potential visitors of the disadvantages of problem areas and/or advantages of alternative areas
6.	Discourage or prohibit use of problem areas
9.	Limit number of visitors in problem areas
10.	Encourage or require a lengthof-stay limit in problem areas
11.	Make access to problem areas more difficult and/or improve access to alternative areas
12.	Eliminate facilities or attractions in problem areas and/or improve facilities or attractions in alternative areas
13.	Encourage off-trail travel
14.	Establish differential skill and/or equipment requirements
15.	Charge differential visitor fees
Ill.	MODIFY THE LOCATION OF USE WITHIN PROBLEM AREAS
16.	Discourage or prohibit camping and/or stock use on certain campsites and/or locations
17.	Encourage or permit camping and/or stock use only on certain campsites and/or locations
16.	Locate facilities on durable sites
19.	Concentrate use on sites through facility design and/or information
20.	Discourage or prohibit off-trail travel
21.	Segregate different types of visitors
IV.	MODIFY THE TIMING OF USE
22.	Encourage use outside of peak use periods
23.	Discourage or prohibit use when impact potential is high
24.	Charge fees during periods of high use and/or high-impact potential
V.	MODIFY TYPE OF USE AND VISITOR BEHAVIOR
25.	Discourage or prohibit particularly damaging practices and/or equipment
26.	Encourage or require certain behavior, skills, and/or equipment
27.	Teach a wilderness ethic
28.	Encourage or require a party size and/or stock limit
29.	Discourage or prohibit stock
30.	Discourage or prohibit pets
31.	Discourage or prohibit overnight use
VI.	MODIFY VISITOR EXPECTATIONS
32.	Inform visitors about appropriate wilderness uses
33.	Inform visitors about conditions they may encounter in the wilderness
VII.	INCREASE THE RESISTANCE OF THE RESOURCE
34.	Shield the site from impact
35.	Strengthen the site
VIII.	MAINTAIN OR REHABILITATE THE RESOURCE
36.	Remove problems
37.	Maintain or rehabilitate impacted locations

as amount, type or timing of use, and so on. Each strategy focuses management attention on one of these important influential factors. Strategies that are related to factors that have little influence on a specific problem can be ignored.

Other classifications have focused on **how** the action is accomplished. Under classifications based on method of approach, management can involve education, dissemination of information, regulation, or site manipulation. Each of these can be used to accomplish a number of strategic purposes. For example, education can be used to reduce use of the entire wilderness, to reduce use of problem areas, to modify the location of use, to modify the timing of use, to modify type of use and visitor behavior, to modify visitor expectations, and even to rehabilitate the resource (by convincing visitors to pick up other visitors' litter, for example). For purposes of identifying management approaches to specific problems, we feel it is more useful to think about techniques grouped under distinct strategies.

Within each strategy, techniques are generally arranged from most to least common. We purposely avoided attempting to arrange techniques from "best" to "worst," because what is best in one situation might be worst in another. The manager must make these decisions. We also avoided arranging them from indirect and manipulative techniques to direct and regulatory techniques (Gilbert and others 1972) because the distinction between the two is not always clear and, under certain circumstances, direct techniques may be preferable to indirect techniques. For example, some manipulative techniques involve possibly inappropriate resource modification and some persuasive techniques discriminate against conscientious visitors. These issues are raised in the discussion of each tactic (pages 16-54).

MANAGEMENTPROBLEMS

The frequency of occurrence of major problems resulting from recreational use of wilderness was evaluated in a survey of all units of the National Wilderness Preservation System in 1979 (Washburne and Cole 1983). The results apply to 110 Forest Service wildernesses, 25 Park Service wildernesses, and the 17 Fish and Wildlife Service wildernesses that received more than 500 visitor-days of use per year-152 areas in all. (As of 1986 there were 445 wildernesses.)

Deterioration of trails and campsites were the most commonly reported problems; littering and crowding were also problems in more than half the wildernesses (table 2). In an earlier survey, based on a sample of 35 wilderness managers, 80 percent of those who responded to an open-ended question about important problems mentioned trail and campsite deterioration. The only other frequently mentioned recreation-related problem was user conflict (Godin and Leonard 1979).

In addition to being a perceived problem in more wildernesses, trail and campsite deterioration were the most widespread problems within individual wildernesses. Managers were asked if problems were present in "a few places" or "many places" (Washburne and Cole 1983). The percentage of wildernesses with problems in "many places" ranged from 33 percent for campsite deterioration and 26 percent for trail deterioration to less than 2 percent for water pollution (table 2). The severity and significance of problems is another matter, however, and one for which we have no data. Problems with human waste may not be widespread, but even a few cases of disease might be considered more serious than widespread trail problems.

In the following section we describe the nature of each major problem, such as trail deterioration or crowding, and subdivide each problem into important subproblems. For example, under campsite problems, both deterioration of existing sites and proliferation of many new sites can be a problem; however, each subproblem requires a different management approach. Then we discuss the primary causes of each subproblem. This information is critical because, when selecting strategies and tactics, it is important to select those that deal with the factors that have a pronounced influence on the severity of each problem.

Finally, for each of these subproblems, we list strategies and primary tactics that can be used to deal with problems. Tactics are only listed here, often with examples. Some of these tactics are rather broad and general. The alternative of discussing very specific tactics would have produced a much longer and unwieldy list. We hope that the level of generality we have chosen is a happy medium. To provide some more specificity, however, many of the tactics under each subproblem are described in a more specific manner here than in the more generic format of table 1. For example, tactic 25, discourage or prohibit particularly damaging practices and/or equipment, is the first under strategy V, Modify Type of Use and Visitor Behavior. When listed under tactics for dealing with water pollution problems, it is described, more specifically, as discourage or prohibit pollution of water sources. Under the section on campsite deterioration problems, the **same** generic tactic is called discourage or prohibit particularly damaging camping practices.

Some of the tactics under different strategies are closely related, differing mostly in how a given change is brought about. For example, modifying the location of visitor use and modifying visitor behavior to avoid camping on fragile sites overlap. Modifying behavior may be how location of camping is modified. Some tactics under the same strategy

Table P-Frequency of common wilderness problems

Problem	Percent of areas where problem	
	Occurs	Occurs in "many places"
Trail deterioration	76	26
Campsite deterioration	72	33
Liner	65	11
Crowding	51	13
Packstock impacts	47	16
Human waste problems	45	4
Impacts on wildlife	36	6
User conflicts	34	3
Water pollution	22	2

are also related. For example, discouraging certain practices (tactic 25) is the opposite of encouraging certain behavior (tactic 26). The two are separated because the tone of one tactic is positive, while the other is negative. Similarly, most of the tactics under strategies I and II are alternative means of reducing use; results of implementation would be similar, but the means used differ greatly.

We list only the most important tactics, which we term primary tactics, those that attack problems directly. Other tactics may help the situation but are less important and are termed secondary tactics. For example, litter problems can be reduced by convincing people not to litter; this is a primary tactic because it deals with the problem directly. Reducing use will also tend to reduce litter because there will be fewer people to leave litter, but this is considered to be a secondary tactic because it is so indirect in approach. Some secondary tactics are mentioned briefly.

Implementing any of these tactics will require selection of specific actions. We present some examples of these actions, such as providing information on maps, using wilderness ranger contacts, and so on, in the discussions of each tactic. But we do not cover every possibility nor do we tell how to prepare detailed action plans.

Finally, before implementing an action intended to mitigate a specific problem, the effects of that action on other problems and places must be considered. One action can ameliorate several problem situations. Therefore, a tactic that is of only secondary importance might be worth implementing if it produces numerous benefits. Alternatively, an action can aggravate other problems or problems in other places. The multiple benefits, costs, and likely side effects associated with implementing tactics are discussed in the section on tactics (pages 16-54).

The primary tactics useful in dealing with each problem and subproblem are summarized in the quick reference guide (table 3).

Table 3-Quick reference guide to primary strategies and tactics for each problem and subproblem

Strategies and tactics	Problems and subproblems: Trails: Deterioration of managed trails	Trails: Development of undesired trails	Campsites: Excessive deterioration of campsites	Campsites: Proliferation of campsites	Litter: Litter	Crowding: Too many encounters	Crowding: Visitor conflict	Stock: Deterioration of grazing areas	Waste: Human waste	Wildlife/fish: Harassment of wildlife	Wildlife/fish: Competition with wildlife	Wildlife/fish: Attraction and feeding wildlife	Water: Contamination of water bodies
I. REDUCE USE OF THE ENTIRE WILDERNESS													
1. Limit number of visitors in the entire wilderness													
2. Limit length of stay in the entire wilderness													
3. Encourage use of other areas													
4. Require certain skills and/or equipment													
5. Charge a flat visitor fee													
6. Make access more difficult throughout the entire wilderness													
II. REDUCE USE OF PROBLEM AREAS													
7. Inform potential visitors of the disadvantages of problem areas and/or advantages of alternative areas						X		X	X	X	X		
8. Discourage or prohibit use of problem areas						X		X	X	X	X		
9. Limit number of visitors in problem areas						X		X	X	X	X		
10. Encourage or require a length-of-stay limit in problem areas						X		X	X	X	X		
II. Make access to problem areas more difficult and/or improve access to alternative areas						X		X	X	X	X		
12. Eliminate facilities or attractions in problem areas and/or improve facilities or attractions in alternative areas						X		X	X	X	X		
13. Encourage off-trail travel						X			X				
14. Establish differential skill and/or equipment requirements						X		X	X	X	X		
15. Charge differential visitor fees						X		X	X	X	X		

(con.)

Table 3-(Con.)

Strategies and tactics	Problems and subproblems: Trails: Deterioration of managed trails	Trails: Development of undesired trails	Campsites: Excessive deterioration of camp sites	Campsites: Proliferation of campsites	Litter: Litter	Crowding: Too many encounters	Crowding: Visitor conflict	Stock: Deterioration of grazing areas	Waste: Human waste	Wildlife/fish: Harassment of wildlife	Wildlife/fish: Competition with wildlife	Wildlife/fish: Attraction and feeding wildlife	Water: Contamination of water bodies
III. MODIFY THE LOCATION OF USE WITHIN PROBLEM AREAS													
16. Discourage or prohibit camping and/or stock use on certain camp sites and/or locations	X		X	X		X	X	X	X	X	X	X	X
17. Encourage or permit camping and/or stock use only on certain campsites and/or locations	X		X	X		X	X	X	X	X	X	X	X
18. Locate facilities on durable sites	X	X	X			X		X	X	X	X	X	X
19. Concentrate use on sites through facility design and/or information		X	X						X				
20. Discourage or prohibit off-trail travel		X								X	X		
21. Segregate different types of visitors							X						
IV. MODIFY THE TIMING OF USE													
22. Encourage use outside of peak use periods						X							
23. Discourage or prohibit use when impact potential is high	X	X						X		X	X		
24. Charge fees during periods of high use and/or high-impact potential	X					X		X		X	X		
V. MODIFY TYPE OF USE AND VISITOR BEHAVIOR													
25. Discourage or prohibit particularly damaging practices and/or equipment		X	X	X	X	X	X	X	X	X	X	X	X
26. Encourage or require certain behavior, skills, and/or equipment		X	X	X	X	X		X	X	X	X	X	X
27. Teach a wilderness ethic		X	X	X	X	X	X	X	X	X	X	X	X
28. Encourage or require a party size and/or stock limit			X				X	X			X		

(con.)

Table 3-(Con.)

Strategies and tactics	Problems and subproblems: Trails: Deterioration of managed trails	Trails: Development of undesired trails	Campsites: Excessive deterioration of campsites	Campsites: Proliferation of campsites	Litter	Crowding: Too many encounters	Crowding: Visitor conflict	Stock: Deterioration of grazing areas	Waste: Human waste	Wildlife/fish: Harassment of wildlife	Wildlife/fish: Competition with wildlife	Wildlife/fish: Attraction and feeding wildlife	Water: Contamination of water bodies
V. (con.)													
29. Discourage or prohibit stock	X						X	X			X		
30. Discourage or prohibit pets							X		X				
31. Discourage or prohibit overnight use								X		X	X		
VI. MODIFY VISITOR EXPECTATIONS													
32. Inform visitors about appropriate wilderness uses							X						
33. Inform visitors about conditions they may encounter in the wilderness							X						
VII. INCREASE THE RESISTANCE OF THE RESOURCE													
34. Shield the site from impact	X											X	
35. Strengthen the site	X												
VIII. MAINTAIN OR REHABILITATE THE RESOURCE													
36. Remove problems					X				X				
37. Maintain or rehabilitate impacted locations	X	X	X	X									

Trail Deterioration

The majority of the impact that occurs along trails is the purposeful result of trail construction and maintenance. Trail impacts become a problem when managed trails (those that are either agency-built or agency-sanctioned) deteriorate to the point where they are difficult to use or where unmanaged trails are developed by visitor use. Therefore, trail deterioration problems can be divided into two separate subproblems: (1) deterioration of the tread of managed trails, usually through erosion or the development of muddy stretches, and (2) development of undesired trails, such as multiple trails in meadows or networks of informal trails in popular destination areas (Cole 1987).

SUBPROBLEM l-DETERIORATION OF MANAGED TRAILS

The incidence of erosion and muddiness problems is most strongly related to the location, design, and maintenance of the trail (Bratton and others 1979; Cole 1983a). Some locations (such as sites with erosive or water-saturated soils) and some trail designs (such as steep grades) invite deterioration. Other designs (such as use of water bars or corduroy) can compensate for a poor location. There are also situations where problem incidence is related to the amount and timing of visitor use, particularly of visitors who use stock. Stock have considerably more impact on trails than hikers (Weaver and Dale 1978). Although heavily used trails often are more heavily impacted than lightly used trails, this is not always the case, and amount of use appears to be a less influential factor than trail location, design, and maintenance (Helgath 1975; Cole 1983a). Because the most important factors influencing trail deterioration usually are location, design, and maintenance of 'the trail and the amount and timing of stock use, the primary tactics are:

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit stock use on certain trails (page 32).
17. Encourage or permit stock use only on certain trails (page 34).
18. Locate trails on durable sites (page 35).

Strategy IV. Modify the Timing of Use

23. Discourage or prohibit stock use (or perhaps all use) in seasons when trails are water saturated (page 40).
24. Charge fees for stock (or perhaps all use) in seasons when trails are water saturated (page 41).

Strategy V. Modify Type of Use and Visitor Behavior

29. Discourage or prohibit stock (page 46).

Strategy VII. Increase the Resistance of the Resource

34. Shield the trail from impact (for example, build corduroy in boggy areas) (page 51).
35. Strengthen the trail (for example, surface the trail with gravel) (page 52).

Strategy VIII. Maintain or Rehabilitate the Resource

37. Maintain or rehabilitate the trail (for example, regularly repair water bars) (page 54).

Amount of use affects amount of trail deterioration, but is less influential than other factors. Therefore, we consider all of the tactics under strategies I (Reduce Use of the Entire Wilderness) and II (Reduce Use of Problem Areas) to be secondary tactics. They may contribute to easing problems, but they are unlikely, by themselves, to help much.

SUBPROBLEM 2-DEVELOPMENT OF UNDESIRED TRAILS

Undesired trails develop when use is not sufficiently limited to existing trails. This commonly occurs close to managed trails, in meadows, on muddy stretches, and at switchbacks. The results are multiple braided trails through meadows, wide quagmires in wet areas, and switchback shortcuts. Away from managed trails, undesired trails develop along frequently used cross-country routes and in popular destination areas. Because undesired trails are the result of too many visitors leaving the trail, such trails can be minimized either by keeping visitors on managed trails or by limiting use. Use would have to be reduced to very low levels because trails can develop with very little traffic (Weaver and Dale 1978; Cole 1987). Some of these problems are aggravated by use during seasons when impact potential is high, particularly during snowmelt in mountainous areas when soils are saturated with water. Because this problem is mostly influenced by where people walk, the primary tactics are:

Strategy III. Modify the Location of Use Within Problem Areas

18. Locate trails where unwanted trails are unlikely to develop (for example, locate trails away from meadows and places likely to become muddy and build switchbacks where shortcutting is difficult) (page 35).
19. Concentrate and channel use through trail design (for example, use brush or rock to limit use to one well-defined tread) (page36).
20. Discourage or prohibit off-trail travel (for all users or just stock) (page37).

Strategy IV. Modify the Timing of Use

23. Discourage or prohibit use when soils are water saturated (page 40).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit development of new trails (for example, by prohibiting or asking users not to shortcut switchbacks or not to use trails that are just beginning to develop) (page 42).
26. Encourage certain behavior (for example, walking down the middle of the trail tread) (page 43).
27. Teach a wilderness ethic (for example, stress the importance of not creating new trails) @age 44).

Strategy VIII. Maintain or Rehabilitate the Resource

37. Close and rehabilitate undesired trails (page 54).

Amount of use affects development of unwanted trails, but is not a highly influential factor. Therefore we consider all of the tactics under strategies I (Reduce Use of the Entire Wilderness) and II (Reduce Use of Problem Areas) to be secondary tactics in most cases. There are situations, however, where problems with informal trail networks in popular destinations might be alleviated with dramatic reductions in use of these problem areas.

Campsite Deterioration

As with trail deterioration, there are problems with both the deterioration of desired campsites and the development of undesired campsites. These two subproblems are (1) excessive deterioration of individual sites and (2) the proliferation of more sites than are desired or needed. The definition of what constitutes either excessive deterioration or an excessive number of sites will depend on management objectives, the realities of area-specific use, and environmental factors.

SUBPROBLEM l-EXCESSIVE DETERIORATION OF CAMPSITES

The primary causes of excessive deterioration of individual sites are inappropriate use, visitors spreading out on sites (enlarging campsites), and camping in fragile places. The most pronounced ongoing impact on long-established sites is site enlargement, caused by spreading out (Cole 1986). The amount of use a site receives has little effect on amount of impact, except where use levels are very low (Cole and Fichtler 1983; Marion and Merriam 1985). Erosion, for example, is unlikely to occur on a properly located site, regardless of how frequently it is used. On a poor location, however, pronounced erosion can occur even with light use. Similarly, one party of visitors can chop down more trees for firewood and tent poles and do more damage than countless parties of knowledgeable and concerned visitors. Parties that travel with stock also tend to cause more impact than backpackers (Cole 1983b). Because the most important influences on amount of deterioration are type of use, how visitors behave, and where they camp, the primary tactics are:

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit camping (or only camping with stock) on certain campsites or locations (for example, places that are prone to erosion or, in lightly used areas, sites that have already been disturbed) (page 32).
17. Encourage or permit camping (or only camping with stock) only on certain campsites or locations (for example, on designated sites in popular destination areas) (page 34).
18. Locate campsites on durable sites (page 35).
19. Concentrate and channel use through site design (for example, design traffic flow on sites so that impacts do not spread) (page 36).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit particularly damaging practices and/or equipment (for example, cutting down trees or use of axes or saws) (page 42).
26. Encourage or require certain behavior, skills, and/or equipment (for example, carrying and knowing how and when to use camp stoves) (page 43).
27. Teach a wilderness ethic (for example, stress the fragility of vegetation and the need to minimize impact) (page 44).
28. Encourage or require a party size and/or stock limit (page 45).
29. Discourage or prohibit stock (page 46).
31. Discourage or prohibit overnight use (page 48).

Strategy VIII. Maintain or Rehabilitate the Resource

37. Maintain or rehabilitate campsites (page 54).

A number of secondary tactics are also available. All of the tactics under strategy I (Reduce Use of the Entire Wilderness) would tend to reduce campsite problems, but not substantially. The tactics under strategy II (Reduce Use of Problem Areas) could have more pronounced positive effects on sites in problem areas. But use reductions would have to be substantial and benefits would probably be more than offset by increased impact in areas to which use was dispersed.

The tactics under strategy II may be most useful in lightly used areas because campsite impact can be negligible if very low use levels (often no more than 1 night of use per year [Cole in press]) can be maintained. To be successful, limitations on use must be combined with tactic 16 (discouraging visitors from camping on sites with evidence of previous use), tactic 17 (encouraging visitors to camp on resistant sites), and tactics 25, 26, and 27 (teaching a wilderness ethic that will help visitors learn how to avoid damage and leave minimal evidence of their stay).

Increasing the resistance of the resource (for example, by building tent platforms or hardening sites with wood chips or gravel) could also be an effective means of avoiding excessive deterioration. Because there are other options, and extensive resource manipulation compromises wilderness goals, we consider this to be of secondary importance.

SUBPROBLEM 2-PROLIFERATION OF CAMPSITES

In most cases, the primary cause of campsite proliferation is too much use of destination areas in which use is not concentrated on a relatively small number of campsites. Usually, proliferation can be avoided simply by concentrating use. In very popular places, it may also be necessary to reduce use levels. In very lightly used places, however, proliferation can be avoided if visitors camp on sites that show no evidence of disturbance. Because the most important influence on site proliferation is where and how people camp, the primary tactics are:

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit camping on previously impacted campsites (this applies to low-use areas only) and on fragile sites (this applies everywhere) (page 32).
17. Encourage or permit camping only on sites that are already well-impacted or designated (this is particularly important in high-use areas) and on resistant sites (this applies everywhere) (page 34).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit particularly damaging practices and/or equipment (for example, discourage wood fires-this is particularly important in relatively undisturbed places because fire scars tend to attract repeat use) (page 42).
26. Encourage or require low-impact behavior, skills, and/or equipment (for example, carry and use stoves-this is particularly important in relatively undisturbed places) (page 43).
27. Teach a wilderness ethic (for example, stress the need to avoid creating new campsites) (page 44).

Strategy VIII. Maintain or Rehabilitate the Resource

37. Close and rehabilitate unwanted campsites (page 54).

A number of secondary tactics are also available. All of the tactics under strategy I (Reduce Use of the Entire Wilderness) would tend to inhibit the development of unwanted campsites, but not substantially. The tactics under strategy II (Reduce Use of Problem Areas) could have more pronounced positive effects on sites in problem areas. But use reductions would have to be substantial, and benefits would probably be more than offset by increased impact in areas to which use was dispersed.

There is one exception to this generalization. The number of impacted campsites that are required to accommodate campers in popular places can be reduced if use of these places is reduced. To be successful, however, limitations on use must be combined with tactic 17 (encouraging or permitting camping only on designated or already well-impacted sites) and tactic 37 (close and rehabilitate unnecessary sites). All of the tactics under strategy II, with the exception of tactic 13 (encourage off-trail travel) could be effective in either of these situations. The consequences of increased use elsewhere must be considered.

Litter

Of all major wilderness problems, litter is potentially the simplest one to manage. The "pack-it-in, pack-it-out" policy appears to have been quite successful in reducing problems with litter; many wilderness visitors consider litter to be less abundant than it was in the past (Lucas 1985). Some of this improvement reflects the fact that wilderness rangers spend a large proportion of their time picking up litter. Clearly, visitors who leave their litter are the primary cause of litter problems. Therefore, the primary tactics are:

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit littering (and perhaps prohibit cans and bottles) (page 42).
26. Encourage or require certain behavior, skills, and/or equipment (for example, encourage visitors to pick up other visitors' litter or require litter bags) (page 43).
27. Teach a wilderness ethic (stress the importance of not littering) (page 44).

Strategy VIII. Maintain and Rehabilitate the Resource

36. Remove litter (page 52).

Strategies I and II, by reducing use where littering is a problem, would tend to reduce litter problems, but the effect would not be substantial. These tactics do not seem worth the cost-both to visitors and managers-of implementing actions.

Crowding and Visitor Conflict

Social research has demonstrated that whether visitors feel crowded or not is a function of more than how many other people they meet (Manning 1985; Stankey and Schreyer 1987). The location of the encounter makes a difference; encounters at campsites are less acceptable than those that occur while traveling, and encounters in the core of the wilderness are less acceptable than those near access points. Crowding is also affected by the type of party encountered; encounters between certain types of parties constitute visitor conflict. Encounters with large parties, parties with stock, and parties with pets are potentially more dissatisfying for some parties than encounters with parties without these characteristics. Encounters with parties that are similar to one's own party usually are most acceptable. Visitor expectations also influence the extent to which the number and type of encounters contribute to crowding (Manning 1985). Consequently, there are two relatively distinct subproblems: (1) too many encounters and (2) encounters with parties that are particularly bothersome (conflicting encounters).

SUBPROBLEM l--TOO MANY ENCOUNTERS

The primary cause of too many encounters is simply too many people in one place at one time. This situation is influenced by the number of visitors, as well as when they visit and where they go. Consequently, the primary tactics are:

Strategy II. Reduce Use of Problem Areas

7. Inform potential visitors of the disadvantages of problem areas and/or the advantages of alternative areas (for example, inform visitors of high use levels in problem areas) (page 23).
8. Discourage use of problem areas (for example, have rangers at portals ask visitors not to visit problem areas) (page 24).
9. Limit number of users in problem areas (for example, issue a limited number of permits) (page 25).
10. Encourage or require a length-of-stay limit in problem areas (page 26).

11. Make access to problem areas more difficult and/or improve access to alternative areas (for example, build new trails into alternative areas) (page 27).
12. Eliminate facilities or attractions in problem areas and/or improve facilities or attractions in alternative areas (for example, remove shelters in problem areas) (page 28).
13. Encourage off-trail travel (page 29).
14. Establish differential skill and/or equipment requirements (more stringent requirements would be in effect in problem areas) (page 30).
15. Charge differential user fees (higher fees would be charged in problem areas) (page 31).

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit camping close to trails or other camps (page 32).
17. Encourage or permit camping only on dispersed campsites (page 34).
18. Locate campsites out of sight and sound of each other and trails (page 35).

Strategy IV. Modify the Timing of Use

22. Encourage use outside of peak use periods (page 39).
24. Charge fees during periods of high use (page 41).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit behavior and equipment that increase encounter frequency (for example, other parties will be less likely to notice your presence if you avoid wearing bright clothes or making lots of noise) (page 42).
26. Encourage behavior, skills, and equipment that decrease encounter frequency (for example, camp away from other parties and carry an earth-colored tent) @age 43).
27. Teach a wilderness ethic (stressing the value of minimizing contact with others) (page 44).

We consider strategy I (Reduce Use of the Entire Wilderness) to usually be a secondary strategy. Nevertheless, there are a few areas where total use should be reduced. In these places, the mere redistribution of use is insufficient and the techniques under strategy I are of primary importance. Even in such wildernesses, it would also be worthwhile to simultaneously manage internal use distribution and to modify type of use and visitor behavior to further reduce crowding and conflict.

SUBPROBLEM 2-VISITOR CONFLICT

The factors that most affect visitor conflict are the type of use and behavior of visitors encountered, where encounters occur, and visitor expectations about both the number and type of encounters. Conflicts are most severe when encounters are with dissimilar types of parties, particularly if the type of party encountered or its behavior is considered to be inappropriate. They are also severe when they occur at campsites, in more remote places, and when the encounters are unexpected. Therefore, primary tactics are:

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit conflicting types of use (such as stock, pets, or large parties) from using certain locations (page 32).
17. Encourage or permit conflicting types of use to camp only on certain campsites or use only certain locations (page 34).
21. Segregate different types of users (page 38).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit activities that tend to cause conflict (such as playing radios or target shooting) (page 42).
27. Teach a wilderness ethic (stressing the importance of not disturbing other parties) (page 44).
28. Encourage or require a party size or stock limit (page 45).
29. Discourage or prohibit stock (page 46).
30. Discourage or prohibit pets (page 47).

Strategy VI. Modify Visitor Expectations

32. Inform visitors about appropriate wilderness uses page 49).
33. Inform visitors about conflicting uses they may encounter (page 50).

Although visitor conflict will be reduced by tactics that reduce use of problem areas (strategy II), these are considered to be of secondary importance, in most situations, because there are more direct ways to deal with conflict. Strategy I (Reduce Use of the Entire Wilderness) is also usually a secondary strategy.

Packstock Impact

Many packstock impact problems have already been covered under trail and campsite deterioration and crowding and user conflict. The major additional type of problem is deterioration of grazing areas.

SUBPROBLEM-DETERIORATION OF GRAZING AREAS

Deterioration of grazing areas occurs mainly when grazing use is excessive or when it occurs in fragile areas or at times of the year when fragility is high. Excessive grazing can result from either too many animals or overly concentrated grazing. Because the most influential factors are amount of grazing use and where, when, and how grazing occurs, the primary tactics are:

Strategy II. Reduce Use of Problem Areas

7. Inform potential visitors of the disadvantages (such as insufficient forage) of problem areas and/or the advantages of alternative areas (page 23).
8. Discourage or prohibit stock use of problem (overgrazed) areas (page 24).
9. Limit number of stock in problem areas (for example, issue a limited number of permits) (page 25).
10. Encourage or require a length-of-stay limit for stock in problem areas (for example, limit the stay at heavily grazed meadows to 1 night) (page 26).

11. Make access (especially for stock) to problem areas more difficult and/or improve access to alternative areas (page 27).
12. Eliminate facilities or attractions in problem areas and/or improve facilities or attractions in alternative areas (for example, build hitch rails or corrals in alternative areas) (page 28).
14. Establish differential skill and/or equipment requirements (for example, require pelletized feed and use of hobbles in overgrazed areas) (page 30).
15. Charge differential user fees (for example, charge higher fees to visit heavily grazed areas) (page 31).

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit camping with stock in certain (overgrazed) areas (page 32).
17. Encourage or permit camping with stock in certain areas (places that are either lightly grazed or that can tolerate heavy grazing) (page 34).
18. Locate grazing facilities (such as hitch rails or corrals) on durable sites and close to areas unlikely to be overgrazed (page 35).

Strategy IV. Modify the Timing of Use

23. Discourage or prohibit stock use or grazing when areas are fragile (such as in early season or when soils are wet) (page 40).
24. Charge fees for stock when areas are fragile (page 41).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit particularly damaging grazing practices (such as picketing stock without rotating them frequently) (page 42).
26. Encourage or require behavior, skills, or equipment that minimize stock impact (such as supplemental feed and hobbling of stock) (page 43).
27. Teach a wilderness ethic (stressing the need to avoid overgrazing) (page 44).
28. Encourage or require a party size or stock limit (page 45).
29. Discourage or prohibit stock (page 46).
31. Discourage or prohibit overnight stock use (page 48).

Tactics under strategy I (Reduce Use of the Entire Wilderness), if applied to stock, would tend to reduce this problem, but these usually are of only secondary importance.

Human Waste

Human waste becomes a problem only where use is relatively high. Elsewhere, decomposition usually eliminates wastes before they become a problem. As use grows, it becomes increasingly important for users to dispose of waste properly (Temple and others 1982). Where heavy use is highly concentrated, the only means of avoiding problems is to provide regularly maintained toilet facilities or to reduce amount of use. Therefore, primary tactics are:

Strategy II. Reduce Use of Problem Areas
(These tactics should only be necessary in very heavily used places.)

7. Inform potential visitors of the disadvantages (such as overcrowding) of problem areas and/or the advantages of alternative areas (page 23).
8. Discourage use of problem areas (page 24).
9. Limit number of visitors in problem areas (issue a limited number of permits) (page 25).
10. Encourage or require a length-of-stay limit in problem areas (page 26).
11. Make access to problem areas more difficult and/or improve access to alternative areas (for example, close roads that lead to trailheads that provide access to problem areas) (page 27).
12. Eliminate facilities or attractions in problem areas and/or improve facilities or attractions in alternative areas (for example, remove shelters but leave toilets in problem areas) (page 28).
13. Encourage off-trail travel (page 29).
14. Establish differential skill and/or equipment requirements (for example, require certification of knowledge of minimum impact techniques to visit problem areas) (page 30).
15. Charge differential user fees (for example, charge higher fees to visit problem areas) (page 31).

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit camping where waste disposal is a problem (page 32).
17. Encourage or permit camping only where toilets are provided (in heavily used areas) (page 34).
18. Locate campsites where waste disposal will not be a problem (for example, where soil is deep) (page 35).
19. Concentrate human waste by providing toilets (page 36).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit improper ‘waste disposal (such as disposal on the surface) (page 42).
26. Encourage or require certain behavior, skills, and/or equipment (for example, a trowel for shallow individual burial of waste) (page 43).
27. Teach a wilderness ethic (stress the need for proper waste disposal) (page 44).

Strategy VII. Increase the Resistance of the Resource
(This tactic should only be necessary in very heavily used places.)

34. Shield the site from impact by providing toilets (page 51).

Strategy VIII. Maintain or Rehabilitate the Resource

36. Remove waste from certain types of toilets (this tactic should only be necessary in very heavily used places) (page 53).

Reducing use of the entire wilderness (strategy I) will tend to reduce problems. Again we feel that these tactics are of only secondary importance, as there are more direct and effective means of dealing with waste problems.

Wildlife and Fishery Impacts

Less is known about the severity and causes of wildlife and fishery impacts than some of the preceding problems (Starkey and Larson 1987). Destruction of habitats, caused by human impact on vegetation and soil, can have an adverse effect, particularly on smaller animals (Ream 1980). Because this occurs primarily at campsites and along trails, mitigation strategies are similar. Probably the most important unique subproblems caused by recreational use are (1) unintentional disturbance (harassment) of large mammals and birds; (2) competition between recreational stock, domestic livestock, and wild animals; and (3) attraction of animals, such as bears, rodents, and jays, through feeding or improper food storage. Hunting, fishing, and the planting of fish are separate issues that we consider beyond the scope of the management techniques we are discussing here.

SUBPROBLEMl-HARASSMENT

Disturbance of wildlife is most strongly related to user behavior and where and when use occurs (Ream 1979). Disturbance is most serious when it occurs in critical breeding, feeding, or watering areas or at times of the year when animals are weak or engaged in reproduction. Because many animals will not be disturbed substantially by occasional contact with humans, reducing use in problem areas can also be a useful strategy, but only if use can be kept at very low levels. Primary strategies and techniques are:

Strategy II. Reduce Use of Problem Areas
(Here problem areas are critical wildlife areas.)

7. Inform potential visitors of the disadvantages of critical areas and/or the advantages of alternative areas (for example, advertise the attractiveness of other areas) (page 23).
8. Discourage or prohibit use of critical areas (such as areas around desert water holes) (page 24).
9. Limit number of users in critical areas (issue a limited number of permits) (page 25).
10. Encourage or require a length-of-stay limit in critical areas (page 26).
11. Make access to critical areas more difficult and/or improve access to alternative areas (page 27).
12. Eliminate facilities or attractions in critical areas and/or improve facilities or attractions in alternative areas (page 28).
14. Establish differential skill and/or equipment requirements (for example, require a special certification **to** visit critical areas) (page 30).
15. Charge differential user fees (higher fees to visit critical places) (page 31).

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit camping in critical locations (page 32).
17. Encourage or permit camping only on certain campsites and/or locations (away from critical areas) (page 34).
18. Locate facilities (such as trails and campsites) away from critical areas (page 35).
20. Discourage or prohibit off-trail travel (page 37).

Strategy IV. Modify the Timing of Use

23. Discourage or prohibit use when disturbance potential is high (page 40).
24. Charge fees when disturbance potential is high (to reduce use) (page 41).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit disturbing behavior (such as approaching animals) (page 42).
26. Encourage behavior that minimizes wildlife disturbance (page 43).
27. Teach a wilderness ethic (stressing how easily wildlife is disturbed) (page 44).
30. Discourage or prohibit pets, particularly those running loose (page 47).
31. Discourage or prohibit overnight use in critical areas (page 48).

Tactics under strategy I (Reduce Use of the Entire Wilderness) are of secondary importance.

SUBPROBLEM2-COMPETITION

Competition becomes a problem when excessive grazing occurs in areas where wildlife feed. Because the factors that affect problem severity are amount of grazing, grazing behavior, and where and when grazing occurs, the primary tactics are:

Strategy II. Reduce Use of Problem Areas
(Here problem areas are areas where competition occurs.)

7. Inform potential visitors with stock of the disadvantages of problem areas and/or the advantages of alternative areas (page 23).
8. Discourage or prohibit stock use of problem areas (page 24).
9. Limit number of stock users in problem areas (page 25).
10. Encourage or require a length-of-stay limit for parties with stock in problem areas (page 26).
11. Make access to problem areas more difficult for stock users and/or improve access to alternative areas (page 27).
12. Eliminate stock facilities or attractions in problem areas and/or improve facilities or attractions in alternative areas (page 28).
14. Establish differential skill and/or equipment requirements (such as requiring the' use of supplemental horse feed in problem areas) (page 30).
15. Charge differential user fees (for example, higher fees to visit places where competition is likely) (page 31).

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit camping and/or stock use in certain locations (where competition is likely) (page 32).
17. Encourage or permit camping and/or stock use only on certain campsites and/or locations (designate sites away from places where competition is likely) (page 34).
18. Locate facilities (such as corrals and campsites) away from problem areas (page 35).
20. Discourage or prohibit off-trail stock travel (page 37).

Strategy IV. Modify the Timing of Use

23. Discourage or prohibit stock use when competition with wildlife is likely (page 40).
24. Charge fees for stock use when competition with wildlife is likely (to reduce use) (page 41).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit grazing in problem areas (page 42).
26. Encourage behavior, skills, and use of equipment that minimize competition (such as use of pelletized feed) (page 43).
27. Teach a wilderness ethic (stressing problems of competition between stock and wildlife for food) (page 44).
28. Encourage or require a party size and stock limit (page 45).
29. Discourage or prohibit stock (page 46).
31. Discourage or prohibit overnight use with stock (page 48).

Tactics under strategy I (Reduce Use of the Entire Wilderness) are of secondary importance.

SUBPROBLEM3-ATTRACTION AND FEEDING OF ANIMALS

This problem can be serious, especially in bear country. Although attraction of smaller animals is less serious to humans, it can have a profound impact on those animals affected. The primary cause of problems is improper behavior-either feeding animals or storing foods inadequately. Because bear problems can be particularly pronounced in some locations, where people camp can also be an influential factor. Therefore, the primary tactics are:

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit camping where bear encounters are likely (page 32).
17. Encourage or require camping only on designated sites or in places away from bear concentrations (page 34).
18. Locate campsites in places where bear encounters are unlikely (page 35).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit feeding animals or camping practices that will attract animals (page 42).
26. Encourage or require camping behaviors that will not attract animals (page 43).
27. Teach a wilderness ethic (stress the need to not disrupt animals through feeding or improper food storage) (page 44).

Strutegy VII. Increase the Resistance of the Resource

34. Provide high cross-bars for hanging food in camp (page 51).

All of the techniques under strategies I (Reduce Use of the Entire Wilderness) and II (Reduce Use of Problem Areas) are secondary techniques.

Water Pollution

The severity and causes of recreation-related water pollution problems are even less well understood (Hermann and Williams 1987). Health hazards due to fecal contamination of water have been dealt with under human waste problems. The few attempts to evaluate the extent of fecal contamination in wilderness have found little evidence of problems, even in quite heavily used areas (see, for example, Silverman and Erman 1979). More insidious, and even harder to document, is the subtle deterioration that results from pollution of water bodies. In the same lakes where fecal contamination was generally absent, Taylor and Erman (1979) found changes in ion concentrations and aquatic flora and fauna. Such changes represent profound changes in the composition and function of natural water bodies.

SUBPROBLEM- CONTAMINATION OF WATER BODIES (FROM POLLUTANTS OTHER THAN FECES)

The primary factors that affect the severity of water pollution probably are where and how visitors camp. Therefore, primary tactics are:

Strategy III. Modify the Location of Use Within Problem Areas

16. Discourage or prohibit camping and/or stock use close to water (page 32).
17. Encourage or permit camping and/or stock use only on certain campsites and/or locations (away from water) (page 34).
18. Locate facilities (such as trails and campsites) away from water (page 35).

Strategy V. Modify Type of Use and Visitor Behavior

25. Discourage or prohibit visitor behavior that causes pollution (for example, using soap in water bodies) (page 42).
26. Encourage behavior, skills, and use of equipment that minimize pollution (for example, how to bathe without polluting waters) (page 43).
27. Teach a wilderness ethic (stress the need to avoid pollution of water bodies) (page 44).

Reductions in use will tend to decrease the potential for water pollution problems, but amount of use is a less influential factor than location of use and visitor behavior. Consequently, all techniques under strategies I and II are of secondary importance.

MANAGEMENT TACTICS

In the remainder of this report we describe each management tactic. Here, we have tried to offer information that will enable the manager to decide about which tactics to select. Under each tactic, we provide the following information:

Purpose- What the tactic is meant to accomplish.

Description- An expanded description of the tactic, how it works, and examples of how it might be implemented.

Current Usage- The extent of current usage, based on the Washburne and Cole (1983) survey of wilderness managers taken in 1980. Usage was classified as "common" if practiced by more than 20 percent of area managers. (Very few techniques were practiced by much more than 20 percent of managers.) Other classifications were "infrequent" (practiced in 5 to 20 percent of areas), "rare" (practiced in less than 5 percent of areas), and "none" (no areas use the technique). Data on usage are also available in Bury and Fish (1980) and Fish and Bury (1981). For tactics not covered in the survey, usage is unknown, although we describe the probable extent of usage, based on personal observation and discussions with managers.

Costs to Visitors- We consider opportunities for "primitive and unconfined recreation" to be one of the most important values of wilderness. Anything that diminishes such opportunity is a cost to visitors. When evaluating visitor costs, the following factors must be considered: effect on freedom of choice, obtrusiveness of the technique, when and where the visitor is affected, the number of visitors affected, the importance visitors attach to affected activities, and effects on the ability of visitors to engage in wilderness-dependent activities and obtain wilderness-specific values.

Although we have little substantiating data, we believe that costs to visitors are highest when freedom of choice is eliminated by regulations. Information, education, and persuasion are less costly than rules because visitors retain freedom of choice. The important and common exception occurs where regulation is required to ensure the effectiveness of a program. In such cases regulation promotes the interests of conscientious users (Dustin and McAvoy 1984). Costs are also higher when visitors are aware that they are being managed, in contrast to subtle techniques that leave visitors unaware of being managed. In this regard, persuasive techniques (in which managers ask visitors to do or not do certain things) are no more subtle than regulations, although they do preserve freedom of choice. The least costly techniques are offsite education, information, and site manipulation.

Costs to visitors are high when their activities are controlled onsite, as opposed to techniques that do not constrain visitor choices once they enter the wilderness. Costs are also high when visitors are not aware of management programs until after arriving at the area. For example, costs are high for visitors who are required to stick to a fixed itinerary of assigned campsites every night, particularly if they are not aware of the requirement until reaching the wilderness. A less costly means of rationing and controlling use distribution is to establish a quota for trailheads (but allow free movement within the wilderness). Costs would be particularly low if visitors were made aware of trailhead quotas during the planning stages of their trip because they could alter their plans if this constraint was unacceptable.

Total visitor costs also increase as more visitors are affected by an action. For example, in most wildernesses, prohibiting campfires is much more costly than prohibiting stock because many more people are affected. But this rule (that cost increases as the number of affected users increases) must be tempered by a consideration of the importance visitors attach to the activities they are being asked to forgo. For example, requiring visitors to pack out their litter may be less costly than prohibiting stock-even though more people are affected-because packing out litter is less of a burden than not being allowed to use stock.

Tactics that reduce opportunities for wilderness-dependent activities are particularly costly to visitors. For example, prohibiting all overnight use and allowing only day use can reduce certain problems, but this tactic would seriously limit opportunities to enjoy unique wilderness values such as isolation, challenge, and contemplation.

No type of action can minimize all of these costs. Instead, it will be necessary to balance all of these considerations and try to minimize the aggregate costs of an action. Thus, a regulatory action that affects few visitors offsite may be less costly than a nonregulatory action that affects many visitors onsite.

Costs to Management- It is also important to consider the cost to management of implementing an action. In some cases it can be counterproductive to undertake a program that cannot be effectively implemented due to insufficient funds. For example, it is common for regulations to be established that cannot be adequately enforced. Relocating access points and trails could be very effective in managing certain problems, but current budgets are probably inadequate for many substantial projects. Both short-term and long-term costs need to be considered. Although it is difficult to define costs, particularly in dollar terms, we do attempt some general estimates.

Effectiveness- In this section, we discuss how effective the tactic is likely to be, as well as means of increasing effectiveness. We note situations (such as high- or low-use areas) in which the tactic is likely to be more or less effective than elsewhere. We also mention other tactics that, when used to complement the one being described, increase effectiveness.

Comments- A variety of issues are discussed in this section. A particularly common item of discussion is any likely side effect that should be considered before implementing an action. Most actions taken to mitigate a certain problem, in a specific place, will affect other problems and places. These likely consequences should be understood and planned for. We also mention the acceptability of the technique to users where this is known or can be estimated.

Sources- Finally, we list published sources of information that are relevant to the tactic. These often provide either further discussion of the technique or data useful in evaluating effectiveness, appropriateness, or visitor reaction to the technique. Brief annotations on each source are included in the references section.

Strategy I. Reduce Use of the Entire Wilderness

TACTIC 1: LIMIT NUMBER OF VISITORS IN THE ENTIRE WILDERNESS

PURPOSE	To limit total use directly so that the social and/or ecological impacts of use are reduced.
DESCRIPTION	Require a permit to visit the wilderness and limit the number of permits. Permits are usually issued for groups rather than individuals, and quotas are usually set to limit the number of entrants per day. A more complicated system seeks to prevent the number of visitor groups from exceeding an established number at any time. To do this, with the variation in lengths of stay that always exist, requires a system for calculating numbers of visitors present per day. In effect, the number of expected departures on any day determines how many visitors can enter that day. Various options for allocating and issuing a limited number of permits, such as advanced reservations, first-come, first-served, lotteries, etc., exist (Stankey and Baden 1977).
CURRENT USAGE	Rare. Most areas that limit number of visitors also control internal use distribution (tactic 9).
COSTS TO VISITORS	Low to high. Costs depend on the proportion of visitors who cannot obtain permits and the difficulties associated with applying for a permit. Costs are high for visitors who are denied access to the wilderness on the desired date, especially repeatedly, but low for some visitors with flexible schedules. Visitors, tend to support actions limiting use where necessary (Fazio and Gilbert 1974; Stankey 1979). Moreover, if advance reservations can be made, costs are incurred offsite and can be limited to the planning stages of trips. Thus, areawide use limitation does not restrict visitor freedom and spontaneity as much as use limitation techniques that control internal use distribution. Costs can also be high, however, for visitors with unpredictable leisure schedules if the application process demands advance planning. If use is reduced substantially, visitors who obtain permits may find conditions more enjoyable.
COSTS TO MANAGEMENT	Moderate to high. Costs are associated with development, maintenance, and enforcement of the permit system. Extended office hours and special locations for issuing permits are often necessary to minimize costs to visitors.
EFFECTIVENESS	This is likely to be an effective means of maintaining the status quo. But current problem areas are unlikely to improve substantially because internal use distributions are unaffected. Some redistribution from peak times to times of lower use is likely. This technique is most useful in small areas where use must be limited, but where the existing distribution of use and impact is acceptable. Tactic 9 (limit number of visitors in problem areas) is more generally useful.
COMMENTS	Visitor dissatisfaction can be minimized by clearly communicating the need for use limits. Varying needs of visitors are served best by issuing permits such that (1) access can be obtained during the planning stages of trips (by allowing for advance reservations or a lottery) and, also, (2) allowing some opportunities for spontaneous trips (by leaving some permits available first-come, first-served on or immediately preceding the start of the tip). Usually a specified percentage of permits is available for advance reservations and the remainder for drop-ins. Visitors generally find lotteries less acceptable than other rationing techniques, unless they have had experience with lotteries (as on some whitewater rivers). All tactics involving permits or fees have the side benefit of causing direct contact between managers and visitors, which provides a communication opportunity.
SOURCES	Hendee and Lucas (1973, 1974), Behan (1974) Fazio and Gilbert (1974), Stankey and Baden (1977), Stankey (1979) Bultena and others (1981a), McCool and Utter (1981) Roggenbuck and others (1982) Shelby and others (1982), Stankey and Schreyer (1987).

Strategy I. Reduce Use of the Entire Wilderness

TACTIC 2: LIMIT LENGTH OF STAY IN THE ENTIRE WILDERNESS

P U R P O S E	Provided that this technique does not result in more frequent visits, total use (visitor-days, for example) will be reduced as length of stay is reduced.
DESCRIPTION	Such a limit could be a regulation with a specific time limit or, through information, visitors could be asked to keep lengths of stay short. A permit system would be necessary to provide a record of entry date and a means for enforcing a regulation limiting length of stay.
CURRENT USAGE	Common. For example, Glacier National Park limits stays to 6 nights. Usually limits are not intended to reduce use, however. They are most common where demand greatly exceeds established use limits (such as on whitewater rivers). In such places length-of-stay limits augment a direct limit on numbers of users (tactic l), allowing more visitors access to a limited number of permits.
COSTS TO VISITORS	Low to moderate. Costliness depends on allowed length of stay. Costs are low under the most common current limit of 14 days. Shorter limits would be more costly. Costs are high for visitors who desire the experience of an extended wilderness trip but cannot take a long trip. Costs are incurred onsite, affecting the trip itself, although negative effects can be reduced by making visitors aware of regulations during the planning stages of their trip.
COSTS TO MANAGEMENT	Low to high. Costs will be high unless a permit system is already in effect; if so, additional costs will be low. If limits are regulated, costs are incurred due to the need to develop and maintain a mandatory permit system and to enforce limits. Otherwise the primary cost is information dispersal.
EFFECTIVENESS	Unlikely to reduce total use appreciably. Most wilderness visits are short. Almost half of visits are for less than a day, and the average stay for overnight users is only 3 days (Washburne and Cole 1983). Therefore, length-of-stay limits usually would reduce use very little. Limits would generally have to be a week or less, completely precluding even moderate length trips, before a length-of-stay limit would reduce total use substantially. Stay limits would tend to shift use distribution toward the periphery of areas, with resulting shifts in impacts.
COMMENTS	In our opinion, such limits are justified only where demand greatly exceeds use limits, total use is directly limited by permit, and a substantial proportion of parties desire a trip that exceeds proposed stay limits. Under these circumstances, limits would allow access to more visitors, although changing the type of experience for those who wanted to stay longer. Length-of-stay limits in selected popular parts of the wilderness-without limits elsewhere-would usually be equally effective and still provide opportunities for extended wilderness trips. Even though few visitors take trips with very long stays, such trips seem important in relation to wilderness values. Eliminating the chance for long trips seems unfortunate. Encouraging day-use in place of camping seems inconsistent with wilderness goals.
SOURCES	None

Strategy I. Reduce Use of the Entire Wilderness

TACTIC3: ENCOURAGE USE OF OTHER AREAS

PURPOSE	To reduce total use of the wilderness, particularly by people who place lower values on the area's wilderness characteristics, to reduce social and ecological impacts.
DESCRIPTION	Tell prospective visitors about alternative places, particularly nonwilderness areas, and encourage them to go there. This could involve maps, brochures, answers to inquiries, and personal suggestions.
CURRENT USAGE	Infrequent. Programs to disperse use within the wilderness are more common.
COSTS TO VISITORS	Low. If information is presented accurately and without pressure, there should be almost no cost to visitors, and at least some visitors could find areas that better match their preferences. There could be costs to the current visitors to the other areas, however, if they have to contend with more visitors and their impact.
COSTS TO MANAGEMENT	Low. Might include costs for a brochure or map, but most information would be included in normal contacts with visitors. Training and preparation of background information materials would entail some costs.
EFFECTIVENESS	Unknown. Tests of use redistribution efforts have all been concerned with redistribution within a wilderness-not to other areas. Those studies have shown mixed results, but adequate information, well presented and in a timely way, has resulted in substantial shifts in use. We would expect moderate effectiveness of programs to shift some use to other areas.
COMMENTS	This technique deserves more use. It is nonauthoritarian and potentially helpful to visitors. Diverting some people less dependent on wilderness conditions to nonwilderness areas seems very desirable. Caution is needed to avoid arm-twisting. Information must be presented with ethical sensitivity; it must be truthful (don't say there is good fishing if fishing is actually poor). It is even more difficult to decide whether to omit information about attractions or problems. Too much information might reduce visitors' sense of discovery.
SOURCES	Lime and Lucas (1977), Roggenbuck and Berrier (1981), Krumpe and Brown (1982).

Strategy I. Reduce Use of the Entire Wilderness

TACTIC 4: REQUIRE CERTAIN SKILLS AND/OR EQUIPMENT

PURPOSE	By requiring certain skills or equipment, some potential visitors not possessing these skills or equipment will not be able to enter the area. This will reduce use.
DESCRIPTION	Require evidence of skill, usually in minimum-impact use, either through completion of an acceptable course or passing a test, and/or require possession and use of equipment that reduces social and ecological impacts, such as tents with their own poles; gas camp stoves; tents of subdued, natural colors; high-line hitching ropes for tying horses; etc.
CURRENT USAGE	None. Untried for purposes of reducing use. It has been used to modify type of use (tactic 26) particularly on whitewater rivers and for mountain climbers, for safety and low-impact reasons.
COSTS TO VISITORS	Low to moderate. Poses high costs for those visitors unable or unwilling to meet test or equipment requirements, or who feel the test is unfair. For others, costs are the time, effort, and money required to qualify. These costs need not be high relative to those associated with the trip itself. Costs are incurred offsite and during the planning stages of trips. Some required skill or equipment may contribute to more enjoyable trips for visitors.
COSTS TO MANAGEMENT	Moderate to high. Test development and administration, enforcement, and employee training will all add to costs. Testing skills would usually cost more than checking equipment. If other organizations, schools, and so on, did much of the skill testing, costs would be lower. Costs will be ongoing. Such requirements would be difficult to enforce without a permit system, with its associated costs.
EFFECTIVENESS	This technique will be effective only if skill and equipment requirements are so stringent that many potential visitors are eliminated. Moreover, the strategy of reducing total use is seldom of more than secondary importance for solving problems.
COMMENTS	This technique is likely to be much more useful as part of a program to modify character of use and reduce per capita impacts than to reduce total use. Acceptability to visitors varies from low to moderate.
SOURCES	Hardin (1969), Stankey and Baden (1977), Bultena and others (1981a), McCool and Utter (1981), Shelby and others (1982), Stankey and Schreyer (1987).

Strategy I. Reduce Use of the Entire Wilderness

TACTIC 5: CHARGE A FLAT VISITOR FEE

PURPOSE	By charging a fee, potential visitors who are unable or unwilling to pay the fee will not be able to enter the area. This will reduce use.
DESCRIPTION	Charge a11 visitors the same fee at all times. The fee could be per person or per group, and could be an entry fee, regardless of trip length, a daily fee, or even an annual fee.
CURRENT USAGE	Apparently untried for purposes of reducing use. Fees are charged on a few whitewater rivers, primarily to offset the costs of administering a permit and reservation system. Many National Parks charge an entrance fee, but this only indirectly affects use of wilderness/backcountry.
COSTS T0 VISITORS	Low to moderate. Costliness would depend on the amount of the assessed fee. This technique could be costly to visitors who cannot afford the fee. Generally, however, fees would be low compared to other costs associated with the trip itself. Costs are incurred offsite. Negative effects can be reduced by making visitors aware of costs during the planning stages of their trip.
COSTS T0 MANAGEMENT	Moderate to high. Costs are associated with administration of the permit system, fee collection, enforcement, and management of funds. The cost/benefit ratio for this technique would depend on the extent to which the programs of managing agencies would benefit from revenues generated. Fees usually would require a permit system, with its usual costs, to be enforceable. Annual fees-in effect a license-could operate without a permit system.
EFFECTIVENESS	To be effective, fees must be high enough to reduce use significantly. To be equitable, however, fees should not be so high that highly motivated but poor visitors could not afford to visit. Different types of fees would have different effects. A daily fee would tend to shorten visits; a per-trip fee would reduce numbers of visitors but not lengths of stay. An annual fee would probably reduce numbers of visitors but might result in more trips or longer trips as people try to “get their money’s worth.”
COMMENTS	A fee may be more useful as a source of revenue and a means of supporting management costs than as a management tool. As a management tool, differential user fees (tactics 15 and 24) are likely to be more efficient in dealing with specific problems than flat fees. Acceptability to visitors varies from low to high. Many visitors object to the principle of a use fee in wilderness; for others, acceptability depends on pricing. Visitors usually accept fees better if they know most funds will be used to manage and protect the area they are visiting. Authority to charge entrance fees to wilderness is not now available, although some places charge a fee for processing reservations.
SOURCES	Echelberger and Moeller (1977), Stankey and Baden (1977), Bultena and others (1981a), Roggenbuck and others (1982), Stankey and Schreyer (1987).

Strategy I. Reduce Use of the Entire Wilderness

TACTIC 6: MAKE ACCESS MORE DIFFICULT THROUGHOUT THE ENTIRE WILDERNESS

PURPOSE	Use levels throughout the wilderness could be reduced if it was more difficult to either reach the wilderness or move about within the wilderness.
DESCRIPTION	Access could be made more difficult by closing some of the access roads and trails, by maintaining them to a lower standard, or by removing bridges. Selective changes in the difficulty of access will also alter internal use distributions (tactic 11).
CURRENT USAGE	Unknown. It is doubtful that access is being made more difficult for this purpose in many areas. Usually access becomes more difficult either because there are insufficient funds to maintain road or trail systems or because access to selected places, rather than to the entire wilderness, is made more difficult.
COSTS TO VISITORS	Low to high. Visitors retain freedom of choice about where they can go, and management presence is subtle. Visitors who are not informed of difficult access may be exposed to undesirable hazards, however. Costs can be high for those visitors who cannot reach the area or desired destinations within the area. Visitors who have been to the area before may be bothered by the changes they encounter.
COSTS TO MANAGEMENT	Low to moderate. The major costs would be information dissemination and, in some cases, road closure, trail reconstruction, etc. In the long run, reduced maintenance could create problems that would be costly to correct.
EFFECTIVENESS	This technique could be effective in reducing use and, therefore, reducing problems, particularly with crowding, human waste, and wildlife disturbance.
COMMENTS	Visitor dissatisfaction should not be severe if there are other areas in the vicinity in which access is easier. Visitor acceptance of this technique is divided.
SOURCES	Stankey (1973, 1980).

Strategy II. Reduce Use of Problem Areas

TACTIC 7: INFORM POTENTIAL VISITORS OF THE DISADVANTAGES OF PROBLEM AREAS AND/OR ADVANTAGES OF ALTERNATIVE AREAS

PURPOSE	By convincing visitors that they will have "better" experiences outside of problem areas, it should be possible to reduce use of problem areas. Problem areas can be lake basins, drainages, or other large destination areas.
DESCRIPTION	A wide variety of information could be provided to potential visitors (such as use densities, availability of campsites and horse forage, fishing opportunities, difficulty of travel, bear problems, and scenic attractions). Information can be provided in various formats, from written materials to personal contact. Information provided in guidebooks can be screened, and additions or deletions can be suggested to guidebook authors.
CURRENTUSAGE	Common. This is one of the more popular techniques in current use.
COSTS TO VISITORS	Low. As long as the information is accurate and managers do not attempt to pressure visitors to visit or avoid certain areas, there are few costs to visitors. There could be costs to the current visitors of alternative areas if they have to contend with many new visitors and their impacts.
COSTS TO MANAGEMENT	Low to moderate. Some costs are incurred in the preparation and dispersal of information. Such information may require frequent updating.
EFFECTIVENESS	Lucas (1981) discusses means of increasing the effectiveness of use dispersal through information programs. It is particularly important to provide enough information so that visitors can choose settings that match their desires (use density information is not sufficient). It is also important to get information to visitors during the planning stage of their trips.
COMMENTS	Provision of information can have the added benefit of increasing visitor satisfaction by better matching the desires of visitors with their subsequent experiences. It is important to consider the ethics of providing selective information intended to influence visitors' choices. Information on fishing or hunting opportunities should be phrased so as not to focus excessive pressure on certain areas. Moreover, it is important to plan for increased use of alternative areas, particularly if specific areas are being advertised. Where specific areas are being advertised it is probably easier to manage the effects of altered use distributions because it will be easier to predict where increased use will occur. Visitor support for this technique is high.
SOURCES	Lime and Lucas (1977), Lucas (1981), Martin and Taylor (1981), Roggenbuck and Berrier (1981), Krumpe and Brown (1982), Roggenbuck and others (1982).

Strategy II. Reduce Use of Problem Areas

TACTIC 8: DISCOURAGE OR PROHIBIT USE OF PROBLEM AREAS

PURPOSE	To reduce or eliminate visitor use of problem areas. Prohibiting use should cause a more dramatic reduction in amount of use than discouraging use.
DESCRIPTION	Visitors can be asked not to visit problem areas or visiting problem areas can be made illegal. Closures can apply to specific trails, destination areas, or larger areas within the wilderness, and can be temporary or long term.
CURRENT USAGE	Infrequent. The most common reason for closure of entire areas is to avoid wildlife disturbance or conflict. Some of these closures apply only in certain seasons (tactic 23). A few areas have also closed specific trails. Both Glacier and Yellowstone National Parks, for example, close areas where grizzly bear encounters are likely. The number of areas that discourage but do not prohibit use of certain areas is unknown, but this action is probably common. Closure of specific campsites or of campsites in certain environments-such as meadows-is most common; this is tactic 16.
COSTS TO VISITORS	Low to moderate. Costs depend on the number and desirability of closed places, as well as the availability of desirable alternatives. Costs are high for those visitors who want to visit closed areas. Discouraging use is less costly than prohibiting use because visitors retain freedom of choice; however, this shifts the burden of cost to those conscientious visitors who voluntarily choose to go elsewhere. Costs can be minimized by making visitors aware of closures during the planning stage of their trip, making certain that attractive alternative locations exist, and seeing that visitors are made aware of these alternatives. It is also desirable to provide a good rationale for closures to visitors.
COSTS TO MANAGEMENT	Moderate to high. Costs depend on the number of closures and whether closures are required or encouraged. Costs are higher for prohibiting use than discouraging it. Costs include signing, other types of information dissemination, and enforcement of prohibitions.
EFFECTIVENESS	Area closures can be an effective way to deal with wildlife disturbance problems, or reducing the risks of human-grizzly bear encounters. They may also be an effective solution to documented water pollution problems. Any advantages in reduced crowding or visitor conflict are probably offset by the costs to visitors of access denial. Compliance with closures can be increased by explaining reasons for closures, providing visitors with information prior to entry, providing reasonable alternative use locations, and enforcing closures.
COMMENTS	Problems resulting from increased use of other trails or areas must be considered.
SOURCES	Parsons (1979).

Strategy II. Reduce Use of Problem Areas

TACTIC 9: LIMIT NUMBER OF VISITORS IN PROBLEM AREAS

PURPOSE	Reduce the number of visitors to problem areas directly through a permit system.
DESCRIPTION	A limited number of permits are issued for problem areas. Permits can be issued for specific trailheads, travel zones, individual campsites, or campgrounds.
CURRENT USAGE	Infrequent, but implementation of rationing systems that control internal use distribution is becoming increasingly common. It is currently much more common in the National Park Service than elsewhere. But managers of most wildernesses perceive a need for rationing in the future. Rationing by trailhead, travel zone, or camping area is about equally common at present.
COSTS TO VISITORS	Low to high. Costs depend on how much demand exceeds the supply of permits (this affects the probabilities of visitors being denied access), how visitors obtain permits, and whether permits are issued for trailheads, travel zones, or campsites. Clearly, costs increase as the likelihood of obtaining a permit decreases. Except for a few places during peak use periods, permits are now difficult to obtain only on a handful of wilderness whitewater rivers. Costs to visitors in reduced freedom and spontaneity increase from systems where permits are issued for trailheads to those where permits are issued for travel zones to those where permits are issued for specific campsites. Limiting use by travel zones or campsites restricts visitors' freedom of movement within the area. Trailhead quotas do not limit movement within the area, although some visitors may not be able to enter at their first-choice location. Permits can be made available first-come, first-served, by reservation, or through a lottery. Each favors a select clientele. Local visitors are favored by the first-come, first-served approach; visitors who are able to plan far ahead are favored by the reservation and lottery approaches. Most areas use a combination of approaches to minimize costs for individual clienteles. Lotteries are currently confined to whitewater rivers where demand greatly exceeds the supply of permits.
COSTS TO MANAGEMENT	High. Costs are incurred in developing and maintaining a system for allocating and distributing permits and enforcing permit compliance. Lotteries and reservations are more costly than a first-come, first-served system. Managerial costs also decrease as the level of control of internal use distribution decreases, because compliance problems are reduced. Thus, trailhead quota systems are less costly than systems based on travel zones or campsites.
EFFECTIVENESS	This technique is an effective means of reducing use in problem areas. It can be useful in dealing with crowding problems. When combined with techniques that influence the location of use (strategy III) and visitor behavior (strategy V), it can also help mitigate campsite deterioration, wildlife disturbance, and packstock impact problems.
COMMENTS	As before, the consequences of increased use and impact elsewhere must be considered. It is usually undesirable to spread use uniformly, as this does not provide diversity of conditions and experiences. Trailhead quotas generally provide the optimum balance between effective control of internal use distribution and allowing visitors free and spontaneous movement. Several simulation models exist that can help match trailhead quotas to desired use (Peterson 1977) and encounter levels (Shechter and Lucas 1978; Potter and Manning 1984; Rowell 1986):. Providing opportunities for both advanced planning and last-minute trips, by issuing some permits by reservation and others first-come, first-served, also seems desirable. Visitors tend to support use limitations where they are perceived as necessary to prevent overuse. But visitors who are not familiar with lotteries tend to dislike them. Most visitors strongly dislike being required to stick to a fixed itinerary-a common requisite when permits are issued for travel zones and particularly for specific camping areas.
SOURCES	Hendee and Lucas (1973, 1974), Behan (1974), Fazio and Gilbert (1974), Greist (1975), Echelberger and Moeller (1977), Peterson (1977), Stankey and Baden (1977), Shechter and Lucas (1978), Stankey (1979), Lucas (1980), Bultena and others (1981a, 1981b), McCool and Utter (1981), Parsons and others (1981), Plager and Womble (1981), van Wagtendonk (1981), Roggenbuck and others (1982), Potter and Manning (1984), Parsons (1986), Rowe11 (1986), Stankey and Schreyer (1987).

Strategy II. Reduce Use of Problem Areas

TACTIC 10: ENCOURAGE OR REQUIRE A LENGTH-OF-STAY LIMIT IN PROBLEM AREAS

PURPOSE	By reducing the amount of time that visitors spend in problem areas, total use of these areas is reduced.
DESCRIPTION	Either enforce regulations with a specific time limit or, through provision of information, visitors can be asked to stay only a short time in specific areas. Limits could apply to specific destination areas or larger management units.
CURRENT USAGE	Unknown, but probably rare for purposes of reducing use in problem areas. Regulations on stay seem much more common than encouraging shorter stays. We are aware of some areas with regulated limits in some places. Usually these augment direct limits on numbers of visitors, allowing more visitors access to a limited number of permits. They are most common in wildernesses where limits apply only to use of whitewater rivers. Length-of-stay limits at individual campsites are common; limits are usually 14 days. This action is generally taken to avoid "homesteading," the situation where one party takes over a site for an extended period. It is really a prohibition on a particularly damaging practice-see tactic 25-and it has essentially no effect on amount of use.
COSTS TO VISITORS	Low. Visitors have the option of visiting areas where limits are not imposed. But visitors who choose to visit problem areas anyway will experience some loss of freedom with its associated costs. Negative consequences can be minimized by getting information about area-specific limits to users during the planning stage of their trip.
COSTS TO MANAGEMENT	Low to moderate. Where limits are encouraged rather than required, information dispersal will be the primary cost. Where limits are required, the need for a permit system and enforcement will increase costs substantially.
EFFECTIVENESS	Parsons (1983) describes how a l-night use limit in a popular part of Rings Canyon National Park reduced visitor nights by a factor of two, despite a 35 percent increase in the number of visitors. To be effective, length-of-stay limits must be very low.
COMMENTS	If use of problem areas is reduced substantially, increased use of other areas must be expected and planned for. Stay limits low enough to reduce use effectively also will carry the highest costs for visitors and require the most intensive and costly enforcement by managers.
SOURCES	Parsons (1983).

Strategy II. Reduce Use of Problem Areas

TACTIC 11: MAKE ACCESS TO PROBLEM AREAS MORE DIFFICULT AND/OR IMPROVE ACCESS TO ALTERNATIVE AREAS

PURPOSE	To reduce visitor use of problem areas by shifting some of it to areas that are either better suited for it or little used, through subtly influencing visitors' decisions.
DESCRIPTION	Access can be modified either by maintaining the trails and bridges that provide access to these areas to a lower standard or by improving the quality of trails and bridges that provide access to other places. Bridges over streams could be removed or deliberately not provided. Roads that provide access to trailheads leading to problem areas can be closed or maintained to reduced standards, new roads or trails can be built, and the quality of existing roads and trails that provide access to other places can be improved.
CURRENT USAGE	Infrequent to common. Changes in ease of access are common, but usually access is not altered with the specific intent of manipulating internal use distribution. Improving or building new access roads is about as common as reducing maintenance or closing roads. But upgrading trails or building new trails is two to three times as common as reducing maintenance or closing trails (Washburne and Cole 1983). (Recent budget reductions may have changed this balance.)
COSTS TO VISITORS	Low. Visitors retain freedom of choice about where to go and management presence is subtle. Visitors who are not informed about minimally maintained trails or roads may be exposed to undesirable hazards, however. Some former visitors who return may be displeased by lower standard trails or bridge removal.
COSTS TO MANAGEMENT	Moderate to high. Costs depend on whether most changes involve improving access or reducing maintenance to make access more difficult. Road and trail building or upgrading can be costly. Reduced maintenance can save money, although maintenance to avoid resource damage may still be necessary. Correcting serious damage following a period of neglect can be more expensive than regular maintenance. It is also important to provide up-to-date information on road and trail conditions if use distributions are to change; frequent updating involves some additional costs.
EFFECTIVENESS	This technique could be highly effective if access to problem areas is made sufficiently difficult to reduce use substantially and if information on access conditions is made available to visitors when they are planning a trip. Manipulating access seems particularly appropriate to dealing with problems of wildlife disturbance in specific places.
COMMENTS	As with all techniques under this strategy, the implications of increased use and impact in alternative areas must be considered and planned for. Visitor opinion about the desirability of such actions is divided.
SOURCES	Stankey (1973, 1980), Lucas (1985), Stankey and Schreyer (1987).

Strategy II. Reduce Use of Problem Areas

TACTIC 12: ELIMINATE FACILITIES OR ATTRACTIONS IN PROBLEM AREAS AND/OR IMPROVE FACILITIES OR ATTRACTIONS IN ALTERNATIVE AREAS

PURPOSE	To reduce visitor use of problem areas by shifting some use to areas either better suited for it or lightly used, through subtly influencing visitors' decisions.
DESCRIPTION	The relative attractiveness of problem areas could be reduced through manipulation of facilities and attractions, such as shelters, outhouses, hitch rails, corrals, bridges, signs, and stocked fish. (Manipulating fisheries to modify use in National Forest Wilderness currently is limited by the Policies and Guidelines of the International Association of Fish and Wildlife Agencies accepted by the Forest Service.) Attractiveness can either be reduced in problem areas or increased elsewhere, within the constraints of appropriateness in wilderness.
CURRENT USAGE	Unknown, but probably rare. Removal of facilities, fish stocking, and elimination of fish stocking are all occurring, but such actions are often taken for reasons other than to alter internal use distributions.
COSTS TO VISITORS	Low. Costs are minimal as long as the information that is provided on facilities and attractions is accurate.
COSTS TO MANAGEMENT	Low to high. Costs are incurred in making physical changes and in the preparation and dissemination of information about conditions. Such information may require frequent updating.
EFFECTIVENESS	This technique will be effective only if there is a pronounced shift in the relative attractiveness of areas and this change is communicated to visitors. Good communication will both increase the effect of facility changes and cause shifts in use to occur more rapidly. It may be particularly effective in shifting certain types of visitors, such as stock users and novices-visitors who are especially attracted to certain facilities.
COMMENTS	The appropriateness of providing facilities in wilderness for reasons other than visitor safety and resource protection must be considered. A high level of facility development is considered undesirable by most visitors, and it conflicts with the Wilderness Act and wilderness philosophy. Also, facilities may be most desirable, particularly for resource protection, in problem areas. They are probably least appropriate in remote areas. Again, increased use of alternative areas must be planned for. These problems suggest that generally it will be more useful to remove facilities or attractions in problem areas than to build them elsewhere. Facilities may have to be built in problem areas to protect the resource (strategy VII).
SOURCES	Hendee and others (1968), Stankey (1973), Murray (1974), Echelberger and Moeller (1977), Lucas (1980, 1985), Stankey and Schreyer (1987).

Strategy II. Reduce Use of Problem Areas

TACTIC 13: ENCOURAGE OFF-TRAIL TRAVEL

PURPOSE	If more visitors traveled off-trail, trail encounters would obviously be reduced. Crowding and visitor conflict might also be reduced in camping areas reached by trail.
DESCRIPTION	Off-trail travel could be encouraged in low-impact-use brochures and other sources of information, including contacts with wilderness rangers. Maps could identify areas favorable for cross-country travel.
CURRENT USAGE	Unknown, but probably rare.
COSTS TO VISITORS	Low. Costs are minimal as long as the suggestion to travel off-trail is not too value-laden, making some visitors feel guilty for choosing to use trails instead.
COSTS TO MANAGEMENT	Low. The major costs involve deciding where off-trail travel should be encouraged and communicating these recommendations to visitors.
EFFECTIVENESS	This is unlikely to be very effective because few visitors are comfortable traveling off-trail. Moreover, those who do enjoy off-trail travel will usually seek out remote areas on their own. This technique could reduce crowding and conflict in some places. It might increase crowding and cause ecological impact problems away from trails, however.
COMMENTS	Promoting off-trail travel can have a number of negative consequences; visitor hazards and the creation of undesired impromptu trail systems are the most obvious. Off-trail travel by stock can be particularly damaging. Increased disturbance of wildlife is also a possible undesirable side effect. Cross-country travel is fairly easy in some wildernesses but very difficult in others because of steep topography and heavy vegetation. In most situations, a preferable means of reducing use is to discourage use of problem areas (tactic 8).
SOURCES	None.

Strategy II. Reduce Use of Problem Areas

TACTIC 14: ESTABLISH DIFFERENTIAL SKILL AND/OR EQUIPMENT REQUIREMENTS

PURPOSE	If managers require special skills or equipment to enter problem areas, but they do not require them in other areas, use levels in problem areas are likely to be reduced.
DESCRIPTION	Require evidence of skill, such as in minimum-impact camping, through completion of acceptable courses or passing a test, and/or require possession and use of equipment that reduces impact, such as tents with integral poles; camp stoves; tents of subdued, natural colors; high-line hitching ropes for horses; etc. The certificate would be required for visiting specific places (in effect, a permit).
CURRENT USAGE	Apparently untried for purposes of reducing use in problem areas. In some areas, certain skills and equipment are required only on whitewater rivers or for mountain climbers. These requirements are intended to promote safety and minimize impact rather than reduce use.
COSTS TO VISITORS	Low. Costs are significant only for those visitors who are unable or unwilling to meet test or equipment requirements or who feel the test is unfair, and who only want to visit problem areas. For others who want to visit the problem areas, costs are the time, effort, and money required to qualify. These costs need not be high relative to those associated with the trip itself. Costs are incurred offsite and during the planning stages of trips. Some required skill or equipment may contribute to more enjoyable trips for visitors.
COSTS TO MANAGEMENT	Moderate to high. Development and administration of ski tests, equipment checks, enforcement, and employee training will all add to costs. Testing skills would usually cost more than checking equipment. The fact that requirements would apply in some places but not in others would increase administrative difficulties. A permit system would be required. Costs will be ongoing. Some skill testing might be done by other organizations, schools, etc., which would lower costs.
EFFECTIVENESS	Could be effective if requirements are so stringent that many potential visitors go elsewhere.
COMMENTS	Unfortunately, special skills and equipment are usually more important in little-used and impacted areas than in places that already have problems. Problem areas are usually the most appropriate places for novices and visitors without low-impact training and equipment. Therefore, this technique usually would be counterproductive.
SOURCES	None.

Strategy II. Reduce Use of Problem Areas

TACTIC 15: CHARGE DIFFERENTIAL VISITOR FEES

PURPOSE	By charging visitors more to enter problem areas, the use of these areas is likely to decline.
DESCRIPTION	Charge a fee to visit problem areas, but not other areas that are either better suited to accommodate use or lightly used. Another option would be to charge higher fees in problem areas than elsewhere. Fees might be per visit or per day in problem areas.
CURRENT USAGE	Apparently untried for purposes of reducing use in problem areas. Fees are charged on a few whitewater rivers, but not to visit adjoining parts of the wilderness. Fees are associated with the need to administer a use limitation program only on the river.
COSTS TO VISITORS	Low. Costs are significant only for those visitors who are unable or unwilling to pay the fee and who only want to visit problem areas. Costs to visitors obviously rise as fees increase.
COSTS TO MANAGEMENT	Moderate to high. Costs are associated with fee collection and enforcement; costs would increase with the number of places within the wilderness where fees were charged. The cost/benefit ratio for this technique would depend on the extent to which managing agencies benefited from retaining revenues generated to strengthen management and protection of wilderness.
EFFECTIVENESS	Should be quite effective if fees are high enough to encourage many visitors to go elsewhere.
COMMENTS	Beyond the problem of lack of general authority for charging fees, and particularly differential fees, this technique would have many advantages. Visitor costs are low, particularly if visitors are made aware of fees when planning their trip, and fees are not excessively high. Management costs would not be increased if agencies were allowed to keep the revenues the fees generate and the technique should effectively reduce use of the problem area. The imposition of a fee might make visitors more careful to minimize their impact, although this is uncertain. Some people believe fees can have the opposite effect. It is important, however, to plan for increased use and impact in other places. Acceptability to visitors of fees in general varies from low to high (for example, Stankey 1973; Shelby and others 1982).
SOURCES	Manning and others (1984).

Strategy III. Modify the Location of Use Within Problem Areas

TACTIC 16: DISCOURAGE OR PROHIBIT CAMPING AND/OR STOCK USE ON CERTAIN CAMPSITES AND/OR LOCATIONS

PURPOSE

Both camping and stock use have considerable potential to cause impact. Such impacts could be reduced by discouraging or prohibiting such uses in inappropriate places.

DESCRIPTION

Either discourage or prohibit camping and/or stock use in inappropriate places. Inappropriate places can be those that are particularly fragile or likely to be impacted by use, those that have already been excessively disturbed, or those where use is likely to disturb other visitors. Regulations or suggestions can be applied to specific campsites, larger destination areas, or to classes of sites, such as those close to water or in meadows.

CURRENT USAGE

Common. Many variations on this technique exist. The most widespread are prohibitions on camping and stock use close to water. Camping setbacks from water range from 20 feet to one-half mile; the most common distance is 100 feet. The most common setback for stock is 200 feet; exceptions are made for watering. Camping prohibitions on selected highly impacted campsites are also common, as are prohibitions on camping adjacent to trails and on stock use on certain trails or general areas. Less common are prohibitions on stock in campsites and prohibitions on camping near other campsites, in certain general areas, or in certain ecosystem types such as meadows. Although frequency is unknown, it is common to discourage camping in certain locations (such as close to other camps or trails, close to water, in meadows, on heavily impacted sites, or in heavily used areas). Similarly, it is common to discourage stock use in such locations. Sometimes use is discouraged by obliterating sites, and occasionally by blocking sites with brush or rocks.

COSTS TO VISITORS

Low to high. Costs depend on whether or not regulatory action is taken, the frequency and types of prohibitions, and the attractiveness and availability of alternative use locations. Costs are generally less when regulation is avoided; however, costs can be inequitably borne by conscientious users when use of certain places is discouraged rather than prohibited. Costs increase with the number of closed places and with the value visitors place on camping or using stock in particular locations. Costs also increase if there are few attractive alternative use locations or if visitors are not aware of where such alternatives are located. Costs can be reduced by informing users of prohibitions as early as possible, by providing adequate reasons for closures, and by informing visitors of alternative areas.

COSTS TO MANAGEMENT

Moderate. If relying on visitor compliance with recommended behavior, information must be disseminated. If relying on regulation, information must be disseminated and regulations must be enforced, which raises costs. In both cases, limited signing may be necessary within the wilderness to inform visitors of closures and alternative use locations. Signing at entry points is preferable, and this is usually possible with an easily understood general closure, such as "no camping in meadows."

EFFECTIVENESS

Closures can be an effective means of promoting recovery of "sore spots" or of avoiding damage to particularly rare or valued ecosystems or locations (such as lakeshores). They can also be used to avoid damaging particularly fragile areas, but most closed locations are not really more fragile than locations left open. Prohibiting confinement of stock close to water to avoid water pollution is one example of using this technique to avoid damaging areas particularly prone to impact. Discouraging use of already disturbed sites can be an effective means of avoiding pronounced campsite deterioration-in lightly used places only; this method is counterproductive in heavily used places (Cole and Benedict 1983). Perhaps most frequently, campsites are closed or use of certain types of locations is discouraged to reduce crowding and conflict problems, mainly by making campers less conspicuous and keeping special attractions, such as lakeshores, open for all to use. Effectiveness requires high levels of compliance.

Managers attempting to avoid regulation may want to monitor compliance with suggestions to determine whether regulation is needed or not. In most places, recovery of sore spots will require total elimination of use and assisted rehabilitation (tactic 37); otherwise, long recovery periods will be even longer.

COMMENTS

Closure of campsites or general locations will shift use and impact elsewhere; this should be planned for. Asking visitors to generally not camp on well-impacted sites is likely to promote campsite proliferation, except in places where use levels are very low and visitors are skilled low-impact campers. In the Bob Marshall Wilderness complex, a majority of visitors objected to a regulation prohibiting camping within 200 feet of water (Lucas 1985), and in areas with such regulations, compliance is often poor. Closing some areas to stock use is more generally acceptable (Lucas 1980). Social objectives might be achieved with more specific suggestions to find a campsite screened by trees or topography, and to camp far enough from lakes to avoid monopolizing shorelines.

SOURCES

Parsons (1979), Lucas (1980, 1985), Bultena and others (1981a), Cole (1981a), Roggenbuck and Berrier (1981), Cole and Benedict (1983), Cole and Ranz (1983), DeBenedetti and Parsons (1983), Thornburgh (1986).

Strategy III. Modify the Location of Use Within Problem Areas

TACTIC 17: ENCOURAGE OR PERMIT CAMPING AND/OR STOCK USE ONLY ON CERTAIN CAMPSITES AND/OR LOCATIONS

PURPOSE

Stock and camping impacts can be limited in area1 extent if they occur only in certain places. Moreover, if such places are durable, the severity of impact could be reduced further.

DESCRIPTION

This technique is similar to the preceding technique. Instead of identifying campsites or general locations where camping or stock use is not appropriate, this technique involves identifying places where such use is appropriate. Such a strategy could be implemented by allowing camping or stock use only in certain places. It could also be implemented by asking visitors to camp or use stock only in certain places. Camping or stock use could either be confined to specific designated sites or allowed anywhere within a general area but not outside that area. Regulations or suggestions could apply to camping or stock use or to both.

CURRENT USAGE

Infrequent to common. Requiring visitors to camp on designated sites is infrequent, except in National Parks, where it is a common technique. Designated sites are also used by the Forest Service in such places as the Boundary Waters Canoe Area Wilderness and some southern California wildernesses. Encouraging visitors to camp on previously used campsites is a common practice. Some areas require or ask visitors to camp on designated or previously used sites in certain places, while allowing visitors to camp wherever they want elsewhere. Generally sites are designated in popular areas, while at-large camping is allowed in more remote areas. In National Parks it is common for stock to be allowed only in designated stock camps; however, this restriction is seldom practiced in wildernesses managed by other agencies. Some areas allow stock use only in certain areas or on certain trails; another variation is to allow stock only in traditionally used places. In a few places managers encourage visitors to camp on previously unused sites.

COSTS TO VISITORS

Low to high. Costs depend on the level of regulation, whether or not some places with at-large camping and stock use are also provided, and where camping and stock use opportunities are provided. Costs become high when areas where use is allowed are away from places visitors want to be or where sites are clustered together, eliminating opportunities for campsite solitude. They are also high when confinement of use to selected places is combined with a program requiring visitors to establish a fixed itinerary before entering the area (usually part of tactic 9). The high costs are imposed more by the itinerary, which reduces freedom and spontaneity, than by only being allowed to camp or take stock to certain places. Costs can be reduced by making visitors aware of regulations, reasons for regulations, and alternative opportunities for use while they are planning their trip.

COSTS TO MANAGEMENT

Moderate. If relying on visitor compliance with recommended behavior, information must be disseminated. If relying on regulation, information must be disseminated and regulations must be enforced, with higher costs. Site maintenance costs may also be substantial due to the concentration of use. But this is likely to be offset by the fact that a smaller number of sites require attention.

EFFECTIVENESS

This can be highly effective in avoiding problems with campsite deterioration, packstock impact, human waste, water pollution, trail deterioration, and wildlife disturbance throughout most of the wilderness. It was the most effective of many techniques implemented in order to minimize campsite impacts in a popular lake basin in Glacier Peak Wilderness (Thornburgh 1986). It may result in severe impact problems in certain places because of concentrating use; however, much research suggests that the additional impacts of increased use in popular areas are small. Use concentration may aggravate crowding, however. Wide spacing and screening of designated sites can reduce crowding problems.

COMMENTS

This technique is particularly appropriate in areas of high use and fragility. Although fixed itineraries are strongly disliked by most visitors, attitudes toward designated sites are more positive.

SOURCES

Echelberger and Moeller (1977), Cole (1981a, 1982c), Cole and Dalle-Molle (1982) Cole and Benedict (1983), Echelberger and others (1983), Thornburgh (1986), Marion and Sober (in press).

Strategy III. Modify the Location of Use Within Problem Areas

TACTIC 18: LOCATE FACILITIES ON DURABLE SITES

PURPOSE	A given amount and type of use will cause less impact if that use occurs on a more durable location.
DESCRIPTION	Locate all facilities on durable sites. This would apply particularly to trails, but in certain areas to bridges, agency-built campsites, toilets, and stock-holding facilities. The concept of a durable site can also be extended beyond resource considerations to sites where use is least likely to disturb other visitors' experiences. Thus, managers would attempt to locate facilities in places where (1) physical deterioration is least likely and (2) facilities and parties using them are least obtrusive.
CURRENT USAGE	Unknown, but probably tried, with differing degrees of effort and success, in all areas with facilities.
COSTS TO VISITORS	Low. Costs are negligible except where visitors are required to use facilities and the facilities are not located where visitors want to go.
COSTS TO MANAGEMENT	Low. As long as the facilities would be built anyway, the only additional costs are associated with conducting research into which sites are most durable and then locating sites that meet the criteria established. These costs will be more than offset in the long run by reduced maintenance costs.
EFFECTIVENESS	There is ample evidence that this can be among the most useful techniques for minimizing trail deterioration. Much of the variation in the level of deterioration of neighboring trail segments is a result of differences in site durability. Level of campsite deterioration also differs substantially with factors such as openness of the tree canopy (Marion and Merriam 1985) and vegetation type (Cole 1981b; 1983b). Locating stock-holding facilities away from water effectively reduces the risk of water pollution problems. Routing trails away from areas that wildlife use to feed and breed reduces potential for wildlife impact. Locating facilities in areas with considerable screening and in places where sounds are dampened can reduce problems with crowding. Many other examples of how this technique can effectively reduce problems could also be cited.
COMMENTS	The benefit/cost ratio of this technique is very high, provided that the decision to provide facilities has already been made. Facilities should be justified, of course, as necessary for protecting wilderness resources, not for visitor comfort and convenience.
SOURCES	Dailey and Redman (1975), Helgath (1975), Cole (1981b, 1982a, 1982b, 1983b, 1987).

Strategy III. Modify the Location of Use Within Problem Areas

TACTIC 19: CONCENTRATE USE ON SITES THROUGH FACILITY DESIGN AND/OR INFORMATION

PURPOSE	The area1 extent of impact can be reduced by channeling or concentrating use on or within individual sites.
DESCRIPTION	The design and placement of facilities such as shelters, fire grates or rings, toilets, tables, potable water supplies, hitch rails, and corrals, where these are judged to be compatible with wilderness objectives, can be used to channel use. Even the design of access trails between facilities or the placement of discrete barriers can serve to minimize the area1 extent of impact. Information about specific facilities and their locations, as well as education about the need to confine impact and not spread out on a site, can also be used to reduce the area1 extent of impacts.
CURRENT USAGE	Unknown. Despite the Wilderness Act's definition of wilderness as a place "without permanent improvements," facility development is common. More often facilities are provided to protect resources rather than to channel use. Fireplace grates, toilets, shelters, and stock-holding facilities are most common. Tent platforms are found in some places, and public cabins are provided in some Alaskan wildernesses. Information provided to visitors on the location of facilities ranges from nonexistent to good. In a few areas visitors are informed of the desirability of concentrating use both on a few sites and within sites; other areas consider concentration to be undesirable.
COSTS TO VISITORS	Low. Visitors are neither required nor asked to alter their preferred behaviors. The major cost of facilities is to visitors who consider developed facilities to be inappropriate-a large proportion in many places. Such costs can be minimized by providing facilities only where absolutely necessary and informing visitors of the location of facilities and the reasons they are necessary.
COSTS TO MANAGEMENT	Low to high. Depends on the number and type of facilities provided and the frequency of required maintenance. Information dissemination costs are low and no enforcement is involved.
EFFECTIVENESS	In the Boundary Waters Canoe Area Wilderness, provision of fire grates and toilets, improvement of tent pads, and rehabilitation of areas where unnecessary site expansion is occurring have effectively limited the area of campsite deterioration (Marion and Sober in press). In Great Smoky Mountains National Park, Bratton and others (1978) report less per capita areal impact around shelters than around campsites. Although not documented, stock-holding facilities are highly effective means of minimizing stock impact in places that receive at least moderate levels of stock use. The effectiveness of information alone is untested; we would guess that it would be low to moderate in effectiveness.
COMMENTS	Providing facilities in selected areas is likely to increase use in these areas. It may also encourage more use by novices. This can be either desirable or undesirable but should certainly be planned for. The desirability of facilities should also be considered. Stankey and Schreyer (1987) review visitor preferences for facility development. Generally visitor preferences are mixed; usually the current level of facility development is preferred. If information alone is tried, systematic monitoring would be desirable. Information is noncontroversial and worth trying.
SOURCES	Leonard and others (n.d.), Hendee and others (1968) McEwen and Tocher (1976), Stankey and Schreyer (1987) Marion and Sober (in press).

Strategy III. Modify the Location of Use Within Problem Areas

TACTIC 20: DISCOURAGE OR PROHIBIT OFF-TRAIL TRAVEL

PURPOSE	By encouraging or requiring visitors to stay on trails, use and impact are concentrated along the existing trail system. Areas away from trails remain undisturbed, and unofficial trail systems should not develop.
DESCRIPTION	Restrictions could be in the form of either regulations or suggestions to avoid off-trail travel. They could be applied only to types of use with a high potential for causing impact (such as large parties or parties with stock) or to all visitors. They could also be applied only in certain areas (such as fragile environments or areas of critical wildlife habitat).
CURRENT USAGE	Unknown. Prohibiting or discouraging people from shortcutting switchbacks is a common action. Suggesting that visitors walk in the trail tread rather than on the side of the trail also is a common element of low-impact educational programs. Some areas prohibit off-trail stock use, and a few areas have smaller party size limits for off-trail travelers.
COSTS TO VISITORS	Most visitors use trails and prefer to stick to them (Lucas 1980); for these, costs are negligible. For visitors who do want to travel off-trail, costs are high. Costs can be reduced by providing alternative areas for off-trail use and by informing visitors of restrictions and why they have been imposed.
COSTS T0 MANAGEMENT	Low to moderate. Costs involve information dissemination and enforcement if off-trail travel is prohibited. Enforcement of a regulation would be difficult because off-trail visitors would be particularly difficult to locate.
EFFECTIVENESS	As a general policy, it is doubtful that this technique would have much effect. It can be a useful means of avoiding problems caused by particularly destructive types of visitors in currently undisturbed areas. Thus, it may be most useful to discourage or prohibit off-trail travel by certain types of users in certain places.
COMMENTS	Given the difficulty of enforcement, discouragement of off-trail travel is probably preferable to regulation.
SOURCES	None.

Strategy III. Modify the Location of Use Within Problem Areas

TACTIC 21: SEGREGATE DIFFERENT TYPES OF VISITORS

PURPOSE	By separating, in space or time, types of use that typically conflict, crowding and conflict can be reduced, resulting in higher quality visitor experiences.
DESCRIPTION	Separate trails could be provided for each type of visitor, or the less common user that typically "causes" the problem could be banned from certain trails or allowed only in certain places. Common conflicting uses include parties with pets or stock, and exceptionally large parties. Segregation of use could be either regulated or suggested. If the segregation is not symmetrical (for example, if stock are prohibited on certain hiking trails, but hikers are never prohibited on stock trails), then this technique is the same as tactic 16-which could also be applied to large parties and conflicting uses other than stock.
CURRENT USAGE	Unknown. There are places where separate trails are provided for hikers and stock parties, particularly in National Parks. Usually uses are only separated for short distances close to trailheads. It is common to prohibit stock on some trails, and probably there are some areas where pets are not allowed on selected trails.
COSTS TO VISITORS	Low to high. Costs increase as increasing numbers of visitors are prohibited from visiting more places. Costs can be reduced by providing desirable use locations for all groups and by making information available during the early stages of trip planning.
COSTS TO MANAGEMENT	Low to moderate. Primary costs are dissemination of information and enforcement, with higher costs. Additional trails and other facilities may be needed.
EFFECTIVENESS	This can be highly effective in reducing visitor conflict.
COMMENTS	A major difficulty is in making certain that each type of visitor is treated fairly. Segregation of uses may require greater facility development, which may be undesirable. Education to reduce objectionable behavior (tactics 25 and 26) and to increase acceptance by other visitors (tactics 32 and 33) may be worthwhile alternatives.
SOURCES	West (1982).

Strategy IV. Modify the Timing of Use

TACTIC 22: ENCOURAGE USE OUTSIDE OF PEAK USE PERIODS

PURPOSE	In many areas, visitor use is highly concentrated in time-during certain seasons, on weekends, and on holidays. This can create serious crowding problems at these times, even though such problems are minimal at other times. The severity of crowding problems could be reduced if some use could be shifted to less popular times of the week or year.
DESCRIPTION	Under strategies I and II, we described techniques for reducing use either in the entire wilderness or in selected problem areas. This technique involves shifting the timing of use, without either spatial shifts or a reduction in total use. The advantages of visiting the area outside of peak use periods can be advertised, usually with data on the current distribution of use at different times and availability of campsites. This could be geared to calendar dates or seasons and/or weekdays vs. weekends. Efforts to encourage off-season use might point out other possible advantages besides lower use, such as fewer biting insects, fall color, and so on. Brochures, information on maps, and news releases are some specific tools that could be used.
CURRENT USAGE	Unknown. Quite a few National Parks and concessionaires within parks have been advertising the advantages of off-season visits. For this and other reasons, the concentration of use in summer has declined in a number of wildernesses. Brochures and other information sources commonly suggest taking midweek trips, when use levels are lower than on weekends.
COSTS TO VISITORS	Low. Visitors can react as they will to information provided. Any effect on their decisions occurs offsite, during the planning stages of trips.
COSTS TO MANAGEMENT	Low. Information must be prepared in a fashion that convinces some visitors to shift the timing of their trips.
EFFECTIVENESS	In many areas, the timing of use is concentrated by a short, “comfortable” use season, opening dates of fishing and hunting seasons, and such factors as the area’s proximity to sources of visitors. Areas that are far from populated areas are likely to experience less pronounced peaks of use on weekends and holidays. This technique may not be effective in remote areas with a short, comfortable use season. Where there seems to be a chance to shift the timing of use, this technique can be a low-cost partial solution to crowding problems.
COMMENTS	Shifting some use from weekends to midweek is unlikely to have undesirable side effects. In some situations, however, resources are particularly fragile during off-seasons (for example, wildlife may be more prone to disturbance or soils may be water saturated). This possibility must be considered when attempting to shift use to low-use seasons. Another factor to consider is the acceptability of increased crowding during off-seasons. Visitors seeking high levels of solitude may already be using off-season periods, and they may be negatively affected by increased use during these periods.
SOURCES	Manning and Powers (1984).

Strategy IV. Modify the Timing of Use

TACTIC 23: DISCOURAGE OR PROHIBIT USE WHEN IMPACT POTENTIAL IS HIGH

PURPOSE	Resource fragility varies between seasons. The same amount and type of use can have very different effects during different seasons, particularly on the severity of wildlife disturbance, trail and campsite deterioration, and packstock impacts. Reducing use during times of high-impact potential can limit impacts.
DESCRIPTION	Limit or avoid all use or certain types of use during particularly sensitive periods. This could either be regulated or suggested. Dates could be standardized or vary, based on specific conditions each year related to soil moisture, stage of plant growth, and so on.
CURRENT USAGE	Rare. A few areas prohibit stock use in the spring and early summer when soils are saturated with snowmelt water and, consequently, are unusually fragile. Other areas have seasonal closures where conflict with wildlife is likely to be detrimental.
COSTS TO VISITORS	Low to moderate. Costs will be low as long as the number of closed areas is low and there are attractive alternative areas to visit. Costs can be minimized by increasing the predictability of closed seasons, providing advance information, and explaining the rationale behind closures. Visitors who have preferred times for visits during critical periods can bear high costs. This might include some hunters in the fall or early-season anglers.
COSTS TO MANAGEMENT	Moderate. Costs include dissemination of information and enforcement. Costs should usuallv include monitoring of conditions to assess whether closures are really necessary and when they should be in effect. The timing of closures may differ from year to year. DeBenedetti and Parsons (1983) describe a system of seasonal stock closures, the timing of which can be adjusted to compensate for year-to-year differences in moisture.
EFFECTIVENESS	Where variation in fragility from season to season is high and significant amounts of use occur during fragile seasons, this technique can be highly effective. Moreover, costs to most visitors would be low, although some types of use could be eliminated.
COMMENTS	None.
SOURCES	Bultena and others (1981a), DeBenedetti and Parsons (1983), Cole (1987).

Strategy IV. Modify the Timing of Use

TACTIC 24: CHARGE FEES DURING PERIODS OF HIGH USE AND/OR HIGH-IMPACT POTENTIAL

PURPOSE	Fees could be used as a vehicle to reduce use during either high-use or fragile periods of **time.**
DESCRIPTION	Fees could be charged to visitors only during periods when impact potential is high or, if fees are charged at other times, they could be higher during fragile seasons. Problems with the current lack of authority for charging fees described for tactics 5 and 15 apply here as well.
CURRENT USAGE	Rare. On some whitewater rivers, managers charge visitors only during high-use seasons.
COSTS TO VISITORS	Low. Costs are significant only for those visitors who are unable or unwilling to pay the fee **and** who must visit the area during periods when fees are assessed. Such visitors are probably relatively uncommon.
COSTS TO MANAGE.MENT	Low to high. Costs associated with fee collection and enforcement would be offset if **managing** agencies could retain revenues generated.
EFFECTIVENESS	This technique could be quite effective if the fees charged were high enough to encourage many visitors to avoid high use or fragile seasons.
COMMENTS	Visitor acceptability was moderately high in one hypothetical test. Visitors most readily accept fees known to be devoted to protection and management of the area visited. Legal authority is not now available.
SOURCES	Shelby and others (1982).

Strategy V. Modify Type of Use and Visitor Behavior

TACTIC 25: DISCOURAGE OR PROHIBIT PARTICULARLY DAMAGING PRACTICES AND/OR EQUIPMENT

PURPOSE	To reduce impacts by discouraging or prohibiting visitors from taking particularly damaging actions.
DESCRIPTION	Certain practices and equipment are both unnecessary and severely damaging. Simple examples include carving on trees and littering. Although usually unnecessary, axes are often used to damage trees. Other practices, such as building campfires, are particularly damaging in some situations but not in others. Managers can reduce or eliminate such damage by establishing regulations or a set of suggested practices.
CURRENT USAGE	Common. This is the most widespread specific wilderness management technique. A majority of areas have both informational materials that discourage certain practices and regulations that prohibit others. Such programs vary considerably in the number and types of actions that are either discouraged or prohibited. Some of the most common discouraged or prohibited practices are having campfires, littering, cutting trees, shortcutting switchbacks, confining stock in ways that cause impact, disposing of human waste improperly, and washing in lakes or streams.
COSTS TO VISITORS	Low to high. Costs depend on the subtlety and degree of regulation used to change visitor behavior, as well as the importance to visitors of the practices they are being asked to forego. The highest costs are associated with regulation, because visitors lose their freedom of choice. Even without regulation, however, visitor costs can be high if managers aggressively try to change visitor behavior. This is particularly true if the contact with a ranger occurs within the wilderness. Costs also increase as visitors are asked or required to give up practices they consider important to their experience (such as campfires for many visitors). Costs to visitors can be reduced substantially by providing good reasons for regulations/suggestions, by communicating regulations/suggestions to visitors during the planning stages of trips and, where possible, by providing alternative areas where damaging but reasonable practices (such as campfires) are permissible.
COSTS TO MANAGEMENT	Moderate to high. Regulation requires effective communication of regulations and adequate enforcement. Enforcement costs can be quite high. Costs with persuasive techniques are usually lower. The principal costs are associated with deciding on what practices should be discouraged and in developing written materials and the communication skills of wilderness rangers. With both regulation and persuasion considerable effort should be invested in deciding which practices should be prohibited or discouraged and in which specific situations a given practice is either appropriate or inappropriate.
EFFECTIVENESS	Neither regulations nor low-impact information have been studied enough to determine their effectiveness. There is considerable evidence that the pack-it-in, pack-it-out antilitter campaign has been quite successful. Effectiveness can be increased by providing good reasons for regulations or suggestions, by communicating these to visitors during the planning stage of trips, and by providing alternative areas where damaging but reasonable practices are permissible. Most managers believe that personal contact is more effective in changing visitor behavior than written materials. Research on the effectiveness of different approaches to education and information is scarce, but some of it suggests that written material can be almost as effective in some situations (Roggenbuck and Berrier 1981). Enforcement can be important to increasing the effectiveness of regulations. Dalle-Molle (1979) and Parsons (1983) describe the success of programs that restrict certain practices in Mount Rainier and Kings Canyon National Parks. respectively.
COMMENTS	Lucas (1932) provides a step-by-step procedure for deciding whether to use regulations or education.
SOURCES	Bradley (1979). Fazio (1979). Lucas (198O). Bultena and others (1981a). Fazio and Gilbert (1981). Martin and Taylor (1981). USDA Forest Service (1981). Cole and Dalle-Molle (1982) Hammitt (1982). Lucas (1982). Cole and Benedict (1983).

Strategy V. Modify Type of Use and Visitor Behavior

TACTIC 26: ENCOURAGE OR REQUIRE CERTAIN BEHAVIOR, SKILLS, AND/OR EQUIPMENT

PURPOSE	To reduce the impact of recreational use by encouraging or requiring behavior, skills, and/or equipment unlikely to damage resources.
DESCRIPTION	This technique is similar to the preceding technique. It could be called the "flip side." Instead of a concern with what visitors should not do, this technique is concerned with what visitors should do to reduce impacts. Many low-impact education programs focus primarily on encouraging visitors to behave in ways that minimize impact. Managers can also require visitors to possess certain skills and equipment that can be used to reduce impact. This can reduce per capita impacts, as well as total use (tactic 4) and use of problem areas (tactic 14). This is comparable to requiring drivers to have a license and a vehicle that meets safety standards. These skills and equipment could be required only when visiting places that are particularly vulnerable to impact, such as remote off-trail areas or places where wildlife disturbance is likely.
CURRENT USAGE	Rare to common. The encouragement of low-impact behavior is common. Equipment requirements are infrequent, and skill requirements are rare. Requirements are more commonly implemented for this purpose than as a rationing tool. They are most common on whitewater rivers, where use of rafts makes it relatively easy to transport low-impact equipment such as fire pans and portable toilets. Stock users could be subject to similar requirements.
COSTS TO VISITORS	Low to moderate: Costs are significant only for those who are unable or unwilling to meet skill or equipment requirements. There is little reason why many people should fall into this category. For others, the only costs are the time, effort, and money required to qualify. Costs are incurred offsite and during the planning stages of trips.
COSTS TO MANAGEMENT.	Moderate to high. Costs include development and administration of information, skill tests, inspection of equipment, and enforcement, depending on which specific techniques are used. Regulation will cost more than education, and skill testing could be particularly expensive. If other organizations, schools, etc., could administer tests, costs could be lower.
EFFECTIVENESS	Equipment requirements on rivers have been very effective in reducing campfire impacts and human waste problems (Carothers and others 1984). Skill requirements could also be effective in increasing use of low-impact techniques; this could help reduce most problems. This technique could be particularly effective in minimizing deterioration of places that are currently relatively undisturbed. The effectiveness of low-impact education has not yet been evaluated systematically, but its potential seems great.
COMMENTS	Versions of this technique could be devised that would require special skills and/or equipment only for certain visitors (for example, stock users or those who want to build fires), in certain places (for example, fragile or currently undisturbed places), or at certain times (for example, during winter when wildlife is particularly vulnerable to disturbance).
SOURCES	Wagar (1940), Stankey and Baden (1977), Muth and Clark (1978), USDA Forest Service (1981), Carothers and others (1984).

Strategy V. Modify Type of Use and Visitor Behavior

TACTIC 27: TEACH A WILDERNESS ETHIC

PURPOSE	To contribute to changes in visitor behavior that reduce social and resource impacts of wilderness recreational use. May also result in visitors applying minimum impact practices with better judgment in varying situations as a result of a deeper understanding of overall purposes and values of wilderness.
DESCRIPTION	Teaching a wilderness ethic stresses the philosophy of wilderness values and individual responsibility in relation to these values. It should motivate wilderness visitors to change their behavior and adopt specific minimum impact practices. It focuses on the "why," the foundation for careful wilderness use, in contrast to the "what" and "how" of tactics 25 and 26. It takes time to instill an ethic. Therefore, the opportunities for ethics education must often be provided away from the wilderness.
CURRENT USAGE	Unknown, but probably infrequent except for abbreviated treatment. Teaching a wilderness ethic seems less common than educational programs focused more narrowly on recommended visitor behavior.
COSTS TO VISITORS	Low. The only cost is in time spent in the educational process. Hopefully, such costs should be more than offset by an improved appreciation and understanding of wilderness, as well as pride in having mastered improved skills in minimizing impact. Costs usually are incurred off-site and there is minimal pressure on the visitor to behave in any certain way.
COSTS TO MANAGEMENT	Low to moderate. Costs involve developing educational materials and providing educational opportunities. Because a wilderness ethic is relatively general, costs of developing materials can be shared widely. If educators can be persuaded to present classes on wilderness ethics, even the costs of educating visitors can be low.
EFFECTIVENESS	Although never evaluated, there is much to suggest that this approach has considerable potential. Wilderness visitors tend to be highly committed to the idea of wilderness. They also tend to be highly educated; therefore, they are likely to understand relatively complex subjects and to adjust their behavior accordingly. This technique attacks all problems directly and has low costs for both visitors and managers. Positive benefits from this technique will not be immediate, however, because there usually will be a lag period between education, behavioral changes, and resultant effects on the resource.
COMMENTS	Educational programs have been developed for grade school students and college students, although most programs focus narrowly on specific low-impact practices. More work is needed on both the curriculum of educational programs and how to effectively teach people.
SOURCES	Echelberger and others (1978), Bradley (1979), Fazio (1979), Martin and Taylor (1681).

Strategy V. Modify Type of Use and Visitor Behavior

TACTIC 28: ENCOURAGE OR REQUIRE A PARTY SIZE AND/OR STOCK LIMIT

PURPOSE	Large parties are a source of conflict, with many visitors considering them to be inappropriate and undesirable. There is also some evidence that large parties cause more ecological impact (for example, they are more likely to create large campsites) than many small parties. A party size limit, without reducing total use, would reduce certain problems.
DESCRIPTION	Either encourage visitors to keep parties small, with suggestions about desirable maximum sizes, or establish and enforce a specific maximum party size.
CURRENT USAGE	Common. This is one of the most widespread regulations in wilderness. Although usually a regulation, there are probably some areas where limits are encouraged but not required. Established party size limits range from 5 to 60; the most common limit is 25. Limits between 5 and 50 have been established for packstock; the most common limit is 20. Some places have established more stringent limits for more vulnerable places such as off-trail areas.
COSTS TO VISITORS	Low. Most parties are small. Median size is usually around three; in nine western areas, only about 6 percent of all parties were larger than 10 persons (Lucas 1980). Thus, relatively few visitors would pay any costs, even with a limit as stringent as 10 people. Costs are high for those visitors who prefer or must travel in large parties (such as outfitted or organized groups). Such costs might be reduced by permitting use by large groups under special conditions (for example, if they obtained special permits and/or visited specific locations, or had special skills or equipment that reduced their impact). Informing visitors of limits during trip planning is critical to maintaining low costs to the visitor.
COSTS TO MANAGEMENT	Low to moderate. Information about limits must be disseminated and regulations must be enforced. Any special provisions for oversized groups must be established and administered.
EFFECTIVENESS	Should be very effective in reducing one source of visitor dissatisfaction-encounters with large groups-if the limit is low enough. Effectiveness in reducing ecological problems may be less dramatic than many assume. This is particularly true where limits are high, as they usually are. The importance of a limit on party size to minimizing resource damage is greatest where impact is likely to occur quickly. Thus, limits are most important in fragile areas, in little-used and relatively undisturbed areas, and where parties travel with stock.
COMMENTS	It is possible that a party size limit could reduce the number of parties if larger parties go elsewhere. On the other hand, a reduction in party size might increase the number of parties in some areas. Present knowledge is inadequate to predict which outcome is more likely. There can also be a problem with large parties that split into several smaller groups to comply with the party size limit but then rejoin within the wilderness. Visitor acceptability of party size limits is generally high. Selecting a specific number for a party size limit requires judgment. No formula exists to calculate an ideal number. The situation is parallel to setting speed limits. In our opinion, however, party size limits larger than about 10 persons seem unlikely to have much positive benefit. (As noted earlier, provisions for allowing larger parties under special circumstances may be desirable.)
SOURCES	Lime (1972) Stankey (1973, 1980), Lucas (1980), Roggenbuck and others (1982), Cole (1987) Stankey and Schreyer (1987).

Strategy V. Modify Type of Use and Visitor Behavior

TACTIC 29: DISCOURAGE OR PROHIBIT STOCK

PURPOSE	Generally, stock cause more impact-both social and ecological-than humans (Cole 1987; Stankey and Schreyer 1937). Limiting or eliminating stock use will reduce many types of problems. On the other hand, it will also eliminate or reduce opportunities for a traditional use of wilderness that some visitors value highly.
DESCRIPTION	Either use a variety of communication techniques to persuade visitors to not use stock or establish and enforce a regulation prohibiting stock.
CURRENT USAGE	Rare. Only a few wildernesses prohibit stock use. Prohibition of stock in certain parts of the wilderness (discussed in more detail under tactic 16) is common, however. It is unknown how many areas discourage stock use; this is probably rare.
COSTS TO VISITORS	Low to high. Costs depend on the number of visitors affected. Overall costs are low because few wilderness areas have much use by packstock. Costs to stock users would be very high, however, and overall costs could be high in those areas with considerable stock use. Such costs could be reduced by allowing stock use in some parts of the area or by providing opportunities elsewhere for recreation with stock of a similar kind and quality.
COSTS TO MANAGEMENT	Low to high. In many places the political costs of such an action would be extremely high. Outfitters offering horseback trips would be eliminated if stock use was prohibited. Other costs include dissemination of information and enforcement. Such costs would be offset by less need for facility development and maintenance, particularly of trails.
EFFECTIVENESS	This tactic would be highly effective in dealing with packstock impacts on the environment and visitor experience. Again, this benefit must be weighed against the high cost of lost recreational opportunities for stock users.
COMMENTS	Increased stock use in other places where stock use is not discouraged or prohibited must be considered. Selective prohibitions on stock will generally be more easily defended than a complete ban. Visitors tend to accept closing some areas to horses, even in areas that receive a considerable amount of horse use. Wilderness-wide prohibitions on horse use were less acceptable in one study (Hendee and others 1968). Adoption of low-impact horse use techniques (tactics 25, 26, and 27) and efforts to modify hikers attitudes about horses (tactics 32 and 33) could also help avoid limitations on stock.
SOURCES	Hendee and others (1968), Stankey (1973) Lucas (1980), Cole (1987).

Strategy V. Modify Type of Use and Visitor Behavior

TACTIC 30: DISCOURAGE OR PROHIBIT PETS

PURPOSE	Pets can be considered unnecessary to the wilderness experience, and they can have a significant impact on wildlife and other visitors. Dogs can carry *Giardia,* but so do many other animals and people. Prohibiting or discouraging pets will reduce these impacts. On the other hand, it will also eliminate opportunities for a traditional use of wilderness that some visitors value highly.
DESCRIPTION	Either use a variety of communication techniques to persuade most visitors to not bring pets, particularly dogs, which are the primary concern, or establish and enforce a regulation prohibiting them.
CURRENT USAGE	Common. Pets are prohibited in National Park wilderness. They are rarely prohibited in wildernesses managed by other agencies, although managers of more and more areas discourage visitors from bringing pets, dogs in particular.
COSTS TO VISITORS	Low to high. Costs depend on the number of visitors affected. Although few data are available, parties with pets are probably more common in most wilderness areas than parties with stock; they are still a minority, however. Costs to visitors who travel with pets would be high. Some of them visit National Forest wildernesses because they cannot travel with their dogs in National Parks. Costs could be particularly high for visitors who travel alone and enjoy the companionship of a pet; this is particularly significant for women traveling alone who bring a dog, in part, for protection. Such costs could be reduced by allowing pets in certain parts of the area or by providing opportunities for recreation with pets of a similar type and quality outside the wilderness. Asking visitors not to bring pets retains freedom of choice, but it may make certain visitors feel guilty about bringing pets and place most of the cost on conscientious visitors.
COSTS TO MANAGEMENT	Low to moderate. Political costs would generally be less than with attempts to prohibit stock use, despite the probability that a larger clientele would be affected. Principal costs involve dissemination of information and enforcement if a regulation is established.
EFFECTIVENESS	While a prohibition on pets is likely to largely eliminate problems with pets, there is little evidence that pets cause substantial problems. Observations suggest that asking people not to bring pets is less effective than a prohibition.
COMMENTS	Generally, pets could be allowed but prohibited in places where or at times when wildlife disturbance is likely or in places where visitors who dislike dogs or other pets could go and not meet parties with them. This option is probably more easily defended than a complete ban.
SOURCES	None.

Strategy V. Modify Type of Use and Visitor Behavior

TACTIC 31: DISCOURAGE OR PROHIBIT OVERNIGHT USE

PURPOSE	A prohibition on camping would obviously reduce camping impacts; it would also reduce other problems. On the other hand, it dramatically reduces recreational opportunities in the area.
DESCRIPTION	Camping could be prohibited by establishing and enforcing a regulation, or visitors could be discouraged from camping. This could apply in the entire wilderness or just in certain problem areas.
CURRENT USAGE	Infrequent. It is common in areas administered by the Fish and Wildlife Service, however. The most common reason for a ban on camping is to avoid wildlife disturbance. This action almost always involves prohibiting rather than discouraging camping.
COSTS TO VISITORS	High. Typically, about half of the parties entering wilderness are day-users; these visitors would incur no costs. Costs would be very high for those wanting to camp. Limiting closures to parts of the wilderness and providing alternative areas where camping is allowed are means of reducing costs where closures are necessary. Effectively communicating information about and reasons for closures is important.
COSTS TO MANAGEMENT	Moderate. Costs would be incurred in the dissemination of information and enforcement of regulations.
EFFECTIVENESS	This should be a highly effective way to reduce problems on campsites. Most other problems, except perhaps trail deterioration, should also be alleviated to some extent. Given the importance of what visitors are asked to forego, merely asking visitors not to camp is unlikely to be effective and probably places responsibilities unfairly on conscientious visitors.
COMMENTS	Wilderness-wide bans on camping reduce recreational opportunities so severely that they should be considered only where the resource is highly fragile, unique, and in need of exceptionally strong protection. Eliminating camping contradicts definitions of wilderness by many of its founders, including Aldo Leopold and Bob Marshall, and much of the philosophy of wilderness. Bans in selected places are more reasonable and were covered in more detail under tactic 16.
SOURCES	None.

Strategy VI. Modify Visitor Expectations

TACTIC 32: INFORM VISITORS ABOUT APPROPRIATE WILDERNESS USES

PURPOSE	One of the primary sources of visitor conflict occurs when visitors encounter uses that they consider to be inappropriate in wilderness. If visitors are aware of which uses are legally appropriate, they are likely to react less negatively when encountering a type of use that they would rather not encounter but that is legally appropriate.
DESCRIPTION	Visitors can be informed about appropriate uses through educational programs, written material, and personal contacts. Appropriateness can be defined in terms of both visitor preferences and legal definitions. The legal status of commodity uses, such as livestock grazing, mining, or water storage, could be explained. So could the appropriateness and legality of various types of recreational use that some visitors may not prefer, such as horseback riding or mechanized travel (in a few places).
CURRENT USAGE	Unknown. Use of this technique is increasingly common; more and more areas are developing educational programs that go beyond the mere "do's and don'ts" of low-impact use.
COST TO VISITORS	Low. Management presence is subtle and occurs offsite. Visitors are not asked to change their behavior, so costs are negligible.
COSTS TO MANAGEMENT	Low. Costs are incurred in developing educational materials and providing educational opportunities. Because many areas have the same appropriate uses, the costs of developing materials can be shared widely.
EFFECTIVENESS	Although never evaluated, such a program should be effective in reducing conflict.
COMMENTS	Informing visitors of appropriate uses should be an integral part of either teaching a wilderness ethic or encouraging low-impact behavior and skills (tactics 26 and 27). There are virtually no visitor costs and additional management costs are minimal. Promoting better understanding of other types of use (especially horse-hiker relations) seems important. Finding ways of communicating to hikers the importance of the horse use tradition and how much it means to many horse users will be a challenge.
SOURCES	Stankey and Schreyer (1987).

Strategy VI. Modify Visitor Expectations

TACTIC 33: INFORM VISITORS ABOUT CONDITIONS THEY MAY ENCOUNTER IN THE WILDERNESS

PURPOSE	By informing visitors about which parts of the wilderness are crowded, which are used by recreational stock, which provide certain recreational experiences, and so on, visitors could avoid situations they do not like and not be surprised by conditions they did not expect to find. Beyond conditions related to recreation use, this can also apply to such conditions as the presence of dams or sheep and cattle grazing. By modifying visitor expectations so that they fit better with conditions they are likely to encounter, problems with crowding and conflict should be reduced.
DESCRIPTION	Visitor information and education programs can provide this information, using a variety of communication techniques. Some conditions (such as the presence of certain types of uses) or permanent features (such as dams) can be described on maps and in brochures. More detailed information (such as where bands of sheep are grazing) will need to be updated, perhaps by inexpensive, small handout maps or notes on maps in ranger stations.
CURRENT USAGE	Unknown. Quite a few areas provide highly selective information, but few areas provide very complete information of this type.
COSTS TO VISITORS	Low. Costs would increase if the information provided was inaccurate or biased in an attempt to get visitors to behave in a certain way.
COSTS TO MANAGEMENT	Low to moderate. Costs involve some monitoring of conditions, selection of information to be presented, and dissemination of this information. It is best to get information to visitors during the planning of trips so that they can plan accordingly.
EFFECTIVENESS	This should be an effective means of reducing visitor crowding and conflict. Visitors may still encounter situations they do not like, but they should not be surprised and they freely chose to visit the area. At some point, however, visitors will be dissatisfied with conditions whether they know about conditions in advance or not. At that point, additional management actions will be needed.
COMMENTS	If provision of such information results in pronounced shifts in the distribution of use, this may have to be managed. Visitor interest in information of wilderness use and conditions is high.
SOURCES	Lime and Lucas (1977) Echelberger and others (1978) Bultena and others (198lb), Lucas (1981), Roggenbuck and Berrier (1981), Krumpe and Brown (1982), Shelby and others (1983).

Strategy VII. Increase the Resistance of the Resource

TACTIC 34: SHIELD THE SITE FROM IMPACT

PURPOSE	The same amount and type of use will cause less impact if the durability of the site can be increased. We already described decreasing impacts by directing use to durable locations. Tactics under this strategy increase the durability of a given site. One means of increasing durability is to artificially separate visitors from the resource, thus shielding the site from visitor impact.
DESCRIPTION	Shield sites by constructing facilities, including bridges, turnpikes, and "corduroy" on trails, and tent platforms on campsites. Although toilets and shelters primarily serve to concentrate human waste and camping use (tactic 19), they can also be considered a means of shielding the site. Facilities need to be compatible with wilderness goals and definitions. This tactic should be focused on resource protection, not visitor comfort or convenience.
CURRENT USAGE	Rare to common. Actions to shield trails are extremely common. Toilets are less widespread and shelters even less so, but both are still common. Raised tent platforms are rare.
COSTS TO VISITORS	Low to moderate. Costs depend on the obtrusiveness of facilities and visitor preferences. Generally visitors appear to be more accepting of trail development than of campsite development (Stankey and Schreyer 1987). Visitor costs can be reduced by explaining the need for shielding measures to increase visitor understanding.
COSTS TO MANAGEMENT	Moderate to high: Costs depend on the facilities required and the number of sites that must be shielded. Costs are lowest when sites are shielded before they deteriorate. Both construction and maintenance costs need to be considered.
EFFECTIVENESS	This is one of the most effective means of avoiding trail deterioration problems. Unless the trail can be relocated to a durable site (tactic 18), deterioration of muddy stretches, in particular, can be avoided only through bridging of some type. This technique is less effective in avoiding other types of problems.
COMMENTS	The benefits of shielding, in terms of resource protection, must be weighed against the costs of obtrusive structures. (The cure may be worse than the problem!) The relative appropriateness of strengthening, in which conditions are purposely altered (the next technique), and shielding, in which structures protect conditions, must also be' considered. Toilets and shelters may concentrate use undesirably and result in social and resource impacts.
SOURCES	Leonard and others (n.d.), Hendee and others (1968) Stankey (1973) Murray (1974) Proudman (1977) Leonard and Plumley (1979) Lucas (1980).

Strategy VII. Increase the Resistance of the Resource

TACTIC 35: STRENGTHEN THE SITE

PURPOSE	Strengthening techniques involve changing soil and vegetation conditions (and possibly also wildlife behavior) such that they become more resistant.
DESCRIPTION	Take actions to strengthen sites consistent with wilderness goals and definitions. Examples would include using soil cement, water bars, or steps on trails; watering, fertilizing, or planting resistant turf grasses; or opening up the tree canopy to encourage growth of resistant grasses on campsites. Some authors have also discussed attempting to habituate wildlife to encounters with humans so that they are less vulnerable to disturbance, as has occurred with certain unhunted species in National Parks (Ream 1979).
CURRENT USAGE	Rare to common. A few trail design techniques, particularly water bars, are standard practices in wilderness. Most other techniques are rare. Because natural soil and vegetation conditions are purposely altered, most site-strengthening techniques are considered inappropriate in wilderness, although they are standard on more developed recreation sites.
COSTS TO VISITORS	Low to moderate. Costs depend on the obtrusiveness of techniques and visitor preferences. Generally visitors more readily accept trail development than campsite development (artificial site manipulation to protect resources) (Stankey and Schreyer 1987). Costs can be reduced by explaining the need for strengthening measures.
COSTS TO MANAGEMENT	Moderate to high. Costs depend on the actions required and the number of sites that must be strengthened. Costs are lowest when sites are strengthened before they deteriorate.
EFFECTIVENESS	This tactic can be highly effective in handling certain types of problems, particularly excessive trail erosion.
COMMENTS	As with shielding, the benefits of resource protection must be weighed against the costs of purposeful and often visually obtrusive alteration of natural conditions. Introducing nonnative species is particularly undesirable.
SOURCES	Leonard and others (n.d.), Proudman (1977), Leonard and Plumley (1979).

Strategy VIII. Maintain or Rehabilitate the Resource

TACTIC 36: REMOVE PROBLEMS

PURPOSE	Instead of attacking the cause of problems, it is possible to deal with problems through rehabilitation after they occur. One type of rehabilitation involves removing problems from the wilderness.
DESCRIPTION	Remove unacceptable evidence of human use. Primary examples are collection and removal of litter and human waste. Exotic plants and animals and unauthorized facilities could also be removed.
CURRENT USAGE	Common. Rangers remove litter from most areas. Removal of human waste from vault toilets is infrequent.
COSTS TO VISITORS	None.
COSTS TO MANAGEMENT	Moderate to high. Costs depend on the volume of material that must be removed and the extent to which removal is just a normal part of ranger patrols. Most areas that utilize toilets use pit toilets and waste is not removed from the area. Help from volunteers and visitors can be enlisted for dealing with litter removal.
EFFECTIVENESS	This technique can be highly effective in dealing with litter and human waste problems. Litter removal will be costly unless visitors are also persuaded not to litter.
COMMENTS	Needs to be supported by programs to change behavior, types of use, or use patterns.
SOURCES	Leonard and others (n.d.), Muth and Clark (1978) Marion and others (1986).

Strategy VIII. Maintain or Rehabilitate the Resource

TACTIC 37: MAINTAIN OR REHABILITATE IMPACTED LOCATIONS

PURPOSE	To maintain or rehabilitate places that have been damaged by human use.
DESCRIPTION	Both trails and campsites can either be maintained and improved while in use or closed and rehabilitated. Trails can be rebuilt, drainage improved, eroded material replaced, etc. Campsites can be seeded or receive transplants, have rocks and logs replaced, soil added or organic material restored, and so on.
CURRENT USAGE	Common. Trails are maintained in essentially all wildernesses. Few areas maintain campsites, other than to clean up and dismantle fire rings-a very common practice-or to remove litter (tactic 36). Assisted rehabilitation of closed trails and campsites is infrequent, but becoming increasingly common.
COSTS TO VISITORS	Low. Costs are incurred only when a favorite site is closed. This cost can be offset by providing attractive alternative sites that can readily be found and by providing clear reasons for the closures.
COSTS TO MANAGEMENT	Moderate to high. Costs depend on the number of trails or sites that must be maintained or rehabilitated. Many areas have used volunteers to reduce costs.
EFFECTIVENESS	This technique can be effective, at least in the long term, but problems will recur unless the causes of problems are also dealt with. In many situations rehabilitation will require very long periods of time.
COMMENTS	Ongoing maintenance of both trails and campsites may be necessary, particularly where use levels are high. It would be best to develop a strategy for avoiding trail and campsite deterioration problems before investing in a program of closure and rehabilitation (refer to other tactics for dealing with trail and campsite deterioration problems).
SOURCES	Proudman (1977), Ittner and others (1979), Cole and Schreiner (1981), Cole and Dalle-Molle (1982), Cole (1987) Marion and Sober (in press).

CONCLUSIONS

In conclusion, we would like to reiterate the following points:

1. When trying to decide on a means of dealing with management problems, there is no substitute for careful identification of specific problems and analysis of the situation in which they occur. Peterson and Lime (1979) and Lucas (1982) provide useful guidelines for such an analysis.

2. There are always many alternative means of dealing with a specific problem. All alternatives should be considered. In most cases, a combination of approaches is likely to be most successful. Usually the most suitable techniques will be those that maximize effectiveness and minimize costs, particularly to the visitor.

3. As Manning (1979) points out, many techniques have multiple benefits; they can also have unwanted side effects. A thorough consideration of all the likely effects of a specific technique will maximize benefits and minimize unwanted effects.

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

Describes pros and cons of potential solutions to common wilderness recreation problems. Covers the purpose of each potential solution, costs to visitors and management, effectiveness, other considerations, and sources of additional information.

KEYWORDS: wilderness, recreation, management techniques, management strategies, backcountry, wilderness planning