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 1-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 use (or perhaps all use) in seasons when trails are water saturated (page 41).

*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) (page 36).
20. Discourage or prohibit off-trail travel (for all users or just stock) (page 37).

*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) (page 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 1-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: