

A Literature Review



The President's Commission
On Americans Outdoors

INT 4901 Publication #168

RESEARCH ON RECREATION TRAILS AND TRAIL USERS

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Edwin E. Krumpe
Wilderness Research Center
University of Idaho
Moscow, Idaho

Robert C. Lucas
Intermountain Research Station
USDA Forest Service
Missoula, Montana

INTRODUCTION

"Walking, hiking, and bicycling are simple pleasures within the economic reach of virtually all citizens." Thus began Trails for America: Report on the Nationwide Trails Study (Bureau of Outdoor Recreation 1966) two decades ago. Trails in our state and national parks and forests provide access to hunting, fishing and camping areas; they provide for nature study, photography, art and inspiration; and they provide opportunities for healthful exercise, the enjoyment of natural beauty and solitude. People can receive these benefits whether they are just hiking for the pleasure of hiking or are hiking as a means of travel to reach attractive destinations or places.

Even in 1966, the authors pointed out that as America has become increasingly urbanized, and as cities, roads and development have encroached on the countryside, opportunities for recreational hiking and riding on trails have steadily decreased. For example, in the National Forest System the number of miles of trails has steadily declined from a peak of 144,000 miles in the 1940's to 101,000 miles in 1980, a decrease of 30 per cent (Wells 1985). Conversely, the use of these trails by Americans more than doubled in the 15 years from 1969 to 1983.

This review will concentrate on trail research in natural resource settings, not in urban and highly developed recreation settings. Furthermore, it will review research literature and not the popular literature about trails that has appeared in magazines and newspapers.

RECOMMENDATIONS

We offer the following recommendations, some of which come directly from the research literature. Others are offered because of glaring shortcomings in the research to date or because trail managers have identified them as a need.

1. More research needs to focus on trails and trail users in non-wilderness settings and on non-overnight trail users. Better integration of trails and other uses of multiple use lands (especially logging) is needed. In addition, more research should focus on trails closer to population concentrations, where the need is probably greatest (Lucas and Rinehart 1976).

2. Current OMB restrictions make it difficult for managers and researchers to obtain approval to survey trail users because of the presumed burden on the public this contact imposes. Such is not the case; in fact, people usually respond enthusiastically and researchers often have to turn away people who volunteer to participate but were not in the random selection (Chilman 1975). The survey approval process needs to be streamlined, with simple, quicker approval for small, voluntary surveys.

3. Trail maintenance should be increased to control environmental damage and meet visitor needs. In wilderness areas, much of the trail system needs to be relocated and redesigned over several decades to reduce damage and provide better experiences for visitors.

4. Determine what the barriers are to providing more trails nearer to where people live. In particular, investigate what are the conceptions of private landowners abutting trails and what can be done to secure their cooperation.

5. Determine to what extent off-road vehicle impacts are acceptable and how their impacts can be confined and mitigated. ORV use can cause heavy impacts to vegetation, soil, water, wildlife and the enjoyment and safety of other recreationists. Research is needed to help managers reach consensus on where, and when ORV use is appropriate.

6. Long-term comparable studies are needed of trail users, their attitudes and characteristics, trends of use over their life cycle, and amount and type of participation. Similarly, long term studies of trail impacts and their recovery should be implemented. Both kinds of studies should be geographically diverse and include both day users and overnight trail users.

7. Education and information should be used whenever possible to elicit desired trail user behavior so as to minimize imposing strict regulations. We need to experimentally test and evaluate education and information approaches to managing trail users. Many attractive and innovative information packages have been tried, however, we know little about whether or not these are effective.

8. Accurate and cost-effective ways to measure trail use should be developed. Research on measuring use was started almost two decades ago, but effective and efficient methods are still wanting.

SUMMARY OF FINDINGS

Relatively little research has been conducted that specifically addresses trails, despite the identification of issues facing trail use, development, and management in many national and state outdoor recreation plans. Trail research has centered around five broad categories of investigation: trends in trail use, measuring use, describing trail users, managing trail users, and controlling resource impacts. This research is briefly summarized below.

Trends in Trail Use

Although many articles and government documents report increasing trends in the recreational use of trails, they primarily have relied upon archival data

gleaned from administrative records kept by land management agencies. These estimates of use are commonly criticized for being of low accuracy, often of noncomparable units of measure among agencies, of noncomparable units over time, and collected over insufficient points in time (usually two) thereby showing only change in use but not establishing a trend (LaPage 1980; Spencer and others 1980; Lucas 1985). Similarly, very few survey research projects of comparable research design have been conducted over time. This makes comparisons or projections of trends from questionnaire data extremely difficult (Van Home and others 1985; Lucas 1985).

In spite of these shortcomings, researchers generally agree that there has been dramatic growth in the use of trails since 1965 and that this growth has somewhat leveled off in recent years. Spencer and others (1980) report that a public survey conducted for the Bureau of Outdoor Recreation in 1965 showed that 9.9 million Americans hiked or backpacked. A similar survey conducted in 1977 revealed that 28.1 million Americans backpacked or hiked. This is nearly a threefold increase. U.S. Forest Service records show that the activities of hiking and mountain climbing have increased steadily from 4 million visitor days in 1966 to 11 million visitor days in 1979. Visitor days of trail use in the 15-year period from 1969 to 1983 grew from about 5.6 million to about 13 million--an increase of 132% (Wells 1985). Van Home and others (1985) report that in 1982-83 approximately 26 million Americans 12 years old or older participated in dayhiking, 9 million backpacked, 20 million drove off-road vehicles, and 6 million went cross-country skiing or ski touring. These all show substantial growth since 1966.

Winter recreation activity has increased across America. Snowmobiling grew very rapidly in the 1970's but its growth rate slowed in the 1980's. Cross country skiing has grown dramatically and is predicted to continue to grow (Taylor and Spencer 1980; Kottke 1980; Stynes 1980).

In wilderness areas, recreationists are limited to non-motorized means of travel and access is primarily by trail. Only one study of trends in total wilderness recreational use is available (Peterson 1981)--an analysis of use of wilderness in the National Forests from 1965 to 1980. Visitor use of those wilderness areas designated by 1965 has almost doubled, increasing 82 percent. Overall, the average annual growth rate has been about 4 percent, with faster growth early in this period and slower growth more recently.

Lucas (1980) reported a more complete picture of wilderness trends in the Bob Marshall Wilderness complex (which includes the Bob Marshall, Great Bear, and Scapegoat Wildernesses) based upon comparable visitor surveys conducted in 1970 and 1982. This research is pertinent to trends in trail use because in both years almost all of the use occurred on trails (3 percent rafted). Total numbers of visitors grew about 60 percent over 12 years, for an annual average increase of 4 percent. Horse use grew by about 20 percent in 12 years while hiker use, most of it camping use rather than day-hiking, more than doubled. The proportion of female visitors grew from 20 to 30 percent.

In summary, research on trends in trail use, although meager, suggests that trails are still very popular and that use probably will continue to grow. This growth will not be as dramatic as in the last decade but a very substantial proportion of Americans will use trails in the next decade.

Measuring Trail Use

There are many kinds of trail users: hikers, horseback riders, bicyclists, motorcyclists, ski tourers, snowshoers, snowmobilers, all-terrain-vehicle riders, joggers, and more recently, "mountain" bicyclists. Lucas (1971) observed that some of these trail users spread out from trails into general cross-country travel off trails, while others are found both on rural trails and on city sidewalks, and still others use urban and rural roads in addition to trails. Most research about trails has sought to identify the amount of use, the kinds of use, the sorts of people who participate, and what their attitudes are about trails and trail use.

Measuring trail use has proven to be difficult, expensive and with some exceptions, has produced data of low accuracy. Most of the studies of trail use and of methods to improve measurement of use were conducted in Wilderness and backcountry recreation areas. Counting visitors at a sample of trailheads on sample days produces accurate estimates (Lucas and others 1971; Lucas and Oltman 1971), but the highly variable visitation makes reliable sampling difficult and costly. Unmanned, voluntary trail registers have been more commonly used to collect information about visitor use. Visitor compliance rates have typically been low and variable (Lucas 1983; Lucas 1975). Registration rates from 12 studies over 20 years (1961-81) varied from a high of 89 percent to a low of 20 percent. For specific types of trail use in the Bob Marshall Wilderness, compliance varied from 0 for day-use horseback riders to 47 percent for backpackers. Summer rates were seven times as high as fall rates. From this Lucas (1983) concluded that unless compliance rates are higher, trail registers alone do not provide a good base for use estimates.

A variation of the voluntary trail register are self-issued mandatory permits which have been used in some western wilderness areas. In the Spanish Peaks Primitive Area, Montana, compliance averaged 53 percent (Lucas and Kovalicky 1981) but dropped sharply as visits became shorter, from 72 percent for campers to 20 percent for day-hikers staying less than 2 hours. Self-issued mandatory permits are no longer being used by wilderness managers.

Automatic electronic trail traffic counters have been used with somewhat more success (James and Schreuder 1971). The counters cannot tell whether the objects counted were people or wildlife, whether they were entering or leaving, or how many people were travelling in groups. Counters combined with automatic movie cameras set to take a few frames when hikers break an electric eye beam (Lucas and Kovalicky 1981) allow the number of visitors and type of group, mode of transportation, and length of stay to be determined.

Mandatory visitor permits are required in most National Park backcountry and in more than one third of all National Forest Wildernesses. They generally yield the most accurate use data (Hendee and Lucas 1973) because compliance is higher than for trail registers. All of these methods of collecting data require considerable effort and expense, and yet often yield questionable results. Better use measurement was one of the research needs listed most often by respondents in a survey of wilderness managers in all agencies (Washburne and Cole 1983), but research focused on technology for measuring wilderness use essentially ended in the early 1970's.

Describing Trail Users and Their Attitudes

The 1982-83 Nationwide Recreation Survey attempted to describe trail users on a national scale (Van Home and others 1985). People 12 to 24 years old had the

highest participation rates, although day hiking was most evenly distributed over all age groups. For all types of trail use, participation increased somewhat with income and education, however, backpacking increased the least.

Many studies, even in large wildernesses, show that much or even most hiking is day-use, rather than associated with overnight camping. Most trail use, particularly in non-wilderness settings, is fairly brief, involving only modest distances (Hendee and others 1978; Lucas and Rinehart 1976).

Knowing the age, income and education of trail users, however, tells planners and managers little about their attitudes, what they are seeking, their preferences for different management practices, or their opinions about other users or trail conditions. Survey research designed to answer these questions has predominantly focused on wilderness and backcountry settings. Typically, in wilderness, people prefer low, levels of encounters along the trail, relative solitude at their campsites, unmodified natural surroundings, and little facility development (Stankey 1973; Lucas 1980). Hikers on the Appalachian Trail, a long distance trail, preferred views of undeveloped mountain ranges and pastoral scenes (Murray 1974). Their desire for solitude, a natural footway, and minimum development increased with degree of hiking experience. Trail hikers in eastern states have generally expressed a preference for trail shelters, provisions for safety, and for information about adverse weather (Taylor and Mackay 1978). In western wilderness, visitors are not clamoring for higher standard trails or for more developed campsites (Lucas 1980).

Because different types of trail users often utilize the same trails, there is a potential for conflict. Satisfaction is often affected by the type of users encountered and how they behave. Encountering large groups is particularly disruptive of others' solitude (Stankey 1973). All four of the major types of trail users (hikers, horseback riders, bicycle riders, and motorcycle riders) usually enjoy meeting their own kind. But they also feel antagonism toward faster or more mechanized users. Every group somewhat enjoys meeting hikers, but hikers prefer not to meet any other types. Furthermore, horseback riders and bicyclists are not particularly fond of motorcycle riders (McCay and Moeller 1976; Hendee and others 1968). Similarly, cross-country skiers prefer not to meet snowmobilers (McCool and Curtis 1980; McLaughlin and Paradise 1980). This would argue for the separation of trail users, particularly motorized users, whenever possible.

Trail users' satisfaction may also be affected by evidence of impacts caused by other users and by the condition of the trails. Littering has a strong negative effect on almost all trail users. Horse manure on the trail is objectionable to many hikers as are deeply eroded or very muddy trails. In general, visitors are not very sensitive to most impacts on soil and vegetation (Lucas 1979). Managers tend to consider impacts to natural resources to be more serious than do visitors. Because impacts have the potential to cause long-term damage, management actions to control impacts should be based mainly on

recognition of long-term consequences and legal and policy goals that set standards for acceptable impact levels.

Managing Trail Use

Trail management can strongly influence both the amount and type of use a trail receives through location and design standards. Environmental impacts and trail durability or degradation depend on location, design, and maintenance. In addition, trail location and design largely control visitors' experiences, to a degree that is rare in recreation management. The level of difficulty and challenge, what will be seen by the hikers and in what sequence, and how aware visitors are of other visitors can all be substantially determined by trail planning. Much of this potential is not achieved, unfortunately. Most trails in natural resource settings were built over 50 years ago for very different purposes. Although most are now used mainly for recreation, their original purpose was primarily to serve as an administrative transportation system, particularly for fire control. Trail deterioration and mediocre recreation experiences often result from such trails designed for other uses. New construction, tailored to recreational use, has been limited by inadequate budgets.

On multiple-use lands, such as the National Forests and some state forest systems, trails have sometimes been destroyed by road construction and logging. Other times, trails have been rendered much less usable because sections through timber cutting units have been obliterated and not reestablished, preventing many people from finding a trail that still exists on the other side of the logging area. A continuing management challenge is to integrate trail recreation considerations into multiple use management.

Research on managing trails and trail users is limited. It has primarily focused on rationing as a means to limit use to prevent crowding and resource impacts, on redistributing use to reduce impacts, on the use of education and information to change use and behavior, and on users' attitudes toward management practices. Once again, this research has primarily been conducted in wilderness and backcountry settings.

A variety of alternative systems to ration use have been proposed (Stankey and Baden 1977). These include rationing by advance reservations, lotteries, queuing (first-come, first-served), price, and merit (requiring applicants to demonstrate knowledge and skill). Trail users in wilderness areas are generally willing to accept restrictions on use if necessary to protect wilderness values, but prefer non-authoritarian approaches, such as information and education, over regulations (Lucas 1980; Lucas and Krumpe, this volume). Restricting the size of groups has more support than limiting the length of stay. There has been a high visitor acceptance of use rationing programs when they are perceived as necessary to protect the environment and the quality of the recreation experience. Even people unable to obtain a permit to visit an area supported the permit system and compliance with the system was very high (Fazio and Gilbert 1974; Stankey 1979).

The use of backcountry trails is very unevenly distributed geographically, with a small proportion of the trails being intensively used while many are relatively lightly used (Lucas 1980). Managers often seek to modify use patterns in heavily used areas to try to maintain natural conditions and to prevent crowding and congestion. Computer simulation models have been developed

considerable progress has been made on how to monitor trail impacts (Leonard and Whitney 1977; Cole 1983) little research that is not entirely site specific exists on how to rehabilitate areas damaged by trail use (Cole, elsewhere in this volume). In conclusion, trail impacts relate mainly to location, design, and maintenance practices, with use a minor factor.

KNOWLEDGE GAPS

While several issues and problems emerge from existing trail research, others have yet to be addressed. The following items represent gaps in our knowledge about trails, trail users, and trail providers.

1. Do the users of trails near population concentrations differ from users of more remote backcountry trails?
2. How do poor trail design and maintenance affect trail users' experiences?
3. What are the human benefits derived from trail use?
4. To what extent should existing trails be relocated to more durable sites and how should managers decide whether to reconstruct or relocate?
5. What are the most effective techniques to rehabilitate damaged trails and trail sites?
6. How can incompatible users be effectively separated?
7. How can more trails be made available near population concentrations?
8. What information would be most useful to trail users and how and when should it be made available?
9. How do trails and trail users 'affect wildlife?
10. What are the long term trends in trail use?
11. What are the barriers to providing more public trails? (How can trail opportunities be provided where public lands are scarce?)
12. What are the barriers to public participation and use of trails?

CONCLUDING ASSESSMENT

Trails have played an important role in the lives of Americans since the discovery of North America. First used by native Americans, trails have become part of our heritage. Trails were essential to early explorers and trappers, and later to the pioneers who settled the land. Today they serve us by providing healthful opportunities to enjoy the out-of-doors to tens of millions of Americans. In spite of their popularity and benefits, the provision and upkeep of our trails has been far outstripped by public demand.

to predict the effects of changing the number of visitors entering at different places on trail encounters and campsite congestion along backcountry trails (Schechter and Lucas 1978; deBettencourt and others 1978; Manning and Ciali 1979).

Using information as a tool to redistribute use has often been proposed by managers because it is nonauthoritarian and allows the resource manager to provide helpful information rather than implement strict regulations (Fazio 1979). Several experiments have shown that visitors can be redistributed to different trails (Krumpe and Brown 1982) and campsites (Lime and Lucas 1977; Roggenbuck and Berrier 1981). It is important that the information be presented in an attractive, nonauthoritarian manner, contain information about a variety of trail and campsite conditions, and be given to visitors early enough to be useful in choosing where to go (Lucas 1981).

Information is frequently used to accomplish other management objectives (such as reducing littering or encouraging use of low impact campsites) (Martin and Taylor 1981) and is successful in some cases as reported elsewhere in this volume by Roggenbuck and Ham.

Research on visitor attitudes about trail design is little studied. Most visitors support existing trail systems, and support simple, narrow winding trails more than high-standard, wide, straight trails (Lucas 1980). One trend study of wilderness trail users reported growing dissatisfaction with trail deterioration (Lucas 1985). Support for trail bridges and adequate signing generally is strong (Hendee and others 1968).

Research on other management practices, such as limiting group size, requiring specific equipment or training, opening or closing access sites, strict enforcement versus informed compliance, charging variable fees, or modifying characteristics of the trails is sorely lacking in the research literature.

Controlling Resource Impacts

The location, construction, vegetation, soil conditions, level of maintenance, and 'the amount and timing of trail use affect how much the trails will impact the resources in which they are located. Impact usually increases from humans to stock to motorized vehicles (Weaver and Dale 1978; Baldwin 1970; Webb and Wilshire 1983) and is more severe during wet soil conditions. Generally, the vegetation of meadows and open forests are more resistant to the use of trails than the vegetation of dense forests. Like campsites, the initial construction and use of trails causes the greatest increase in impacts which then plateaus with moderate to heavy use (Cole 1981, 1983; Foin and others 1977; Summer 1980; Leonard and others 1985; Liddle 1975).

The effects of trail use on wildlife is poorly documented. It is known that recreationists may disturb certain wildlife species, sometimes causing displacement, disruption of feeding, breeding, and care of young, causing reduced populations (Ream 1980). Trails also serve an important role in providing access to game and distributing hunters (James and others 1969; Thomas and others 1976).

Landform, soil type, drainage, trail slope, side slope, and construction and design techniques also affect the amount of impact (Cole 1981). While

considerable progress has been made on how to monitor trail impacts (Leonard and Whitney 1977; Cole 1983) little research that is not entirely site specific exists on how to rehabilitate areas damaged by trail use (Cole, elsewhere in this volume). In conclusion, trail impacts relate mainly to location, design, and maintenance practices, with use a minor factor.

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Research on trails generally has been spotty, has concentrated on remote backcountry settings and has practically ignored the trails located near our metropolitan areas. Trail research has consisted largely of onetime studies, thus failing to identify trends; has often been site specific with little ability to generalize to other areas; and has largely ignored looking at the relationship of trail systems to the broader spectrum of recreation opportunities. Most research has consisted of descriptive studies lacking in theory, and with few exceptions, the studies are not comparable. Furthermore, research support has declined in recent years.

Meanwhile, trail use has grown substantially. Americans are pursuing healthy exercise and outdoor recreation in unprecedented numbers. Trail development has not kept pace with this increase in demand and many trails have been lost to development and roads. Research should contribute significantly to understanding the dynamics of trail use, maintenance, construction, and rehabilitation, as well as lead to better understanding of the millions of Americans who use and enjoy the heritage of our trails.

KEYWORDS

Trails, recreation trails, trail users, trail impacts, trail trends, trail management, wilderness trail users

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