

7 Trends in Wildland Recreation Use and Impacts

The severity of ecological impact problems in wildland areas stems from an ever-increasing participation in wildland types of recreation. Studies conducted over long periods of time, documenting escalating trends in ecological impacts, are nonexistent; however, recent trend data from studies conducted during the late 1980s and 1990s are available. Trend data on nationwide participation in outdoor recreation are much more readily available inasmuch as general use surveys have been conducted since the 1960s.

This chapter reviews the early recreational use of wildland areas, continues with the more current and projected trends in outdoor recreation participation, and concludes with an overview of trends concerning wildland recreation use, users, and impacts. Examination of these general trends in recreation use, and impact trends in some specific wildland areas, provides an indication of the changing relationships, over time, of recreational use and impacts.

EARLY OUTDOOR RECREATION USE

The ecological impacts resulting from recreational use are particularly critical in wilderness and backcountry areas because management objectives for such areas stress maintaining high levels of natural integrity. Early use of wilderness areas increased at a rate faster than most other wildlands. For example, annual growth rates in the use of parks and recreation facilities often exceeded 10 percent from the early postwar period through the mid-1960s. Recreational visits to U.S. Forest Service wilderness increased fourteenfold between 1946 and 1970 (Stankey 1973). Forest Service wilderness areas in California showed an average 16 percent annual increase in use for the 1970 to 1975 period (Hendee, Stankey, and Lucas 1990). Although rates of increase slowed down during the late 1970s and early 1980s, use is still increasing. In fact, the rate of wilderness use started increasing again in the late 1980s and has continued into the 1990s (Cole 1996). Moreover, the land base on which use occurs is decreasing. Designated wilderness acreage is growing, but nondesignated backcountry is shrinking drastically as areas are designated wilderness or becoming roaded.

Among wildland recreation activities on national forests, increases in winter sports have been very rapid (Table 1). Use nearly tripled between 1966 and 1979. Although

**TABLE 1. National Forest Recreation Use by Activity
(Thousands of Visitor Days)**

Activity	1966		1979	
	Use	Percent of Total	Use	Percent of Total
Camping	39,564.5	26.2	54,780.3	24.9
Recreational travel (mechanical)	31,301.1	20.7	49,536.5	22.5
Fishing	14,709.1	9.7	16,776.0	7.6
Hunting	13,118.6	8.7	15,327.9	6.7
Recreational residence use	7,960.5	5.3	6,651.6	3.0
Picnicking	7,887.5	5.2	8,874.2	4.0
Winter sports	5,219.6	3.5	14,485.0	6.6
Hiking and mountain climbing	4,277.8	2.8	11,176.9	5.1
Organizational camp use	4,287.2	2.8	4,086.8	1.8
Boating	4,006.5	2.6	7,072.1	3.2
Viewing scenes and sports entertainment	3,926.8	2.6	8,321.1	3.8
Resort use	4,003.5	2.6	4,308.9	1.9
Swimming and scuba diving	3,076.9	2.0	4,632.3	2.1
Horseback riding	2,065.9	1.4	3,166.4	1.4
Visitors information services	2,058.8	1.4	4,121.8	1.9
Gathering forest products	1,241.7	.8	3,916.1	1.8
Nature study	796.4	.5	1,210.9	.5
Waterskiing and other water sports	641.0	.4	888.0	.4
Games and team sports	585.5	.4	832.8	.4
Total	150,728.9	99.6	220,165.6	99.6

Source: U.S. Forest Service.

much of this growth represents increased use of developed downhill ski areas, participation in cross-country skiing and snowmobiling also increased dramatically. Hiking and mountain climbing also increased nearly threefold over this period. Similar increases have occurred on lands outside the national forests. A public survey conducted in 1965 for the Bureau of Outdoor Recreation showed that 9.9 million Americans hiked or backpacked. This number had increased to 28.1 million Americans when the survey was repeated in 1977.

Backcountry camping figures for the National Park Service have been kept on a nationwide basis only since 1972. However, individual parks have trend data over a longer period of time. For Great Smoky Mountains National Park, backcountry overnight use was about 105,000 user nights in 1975, a 53 percent

increase over 1972 use levels and a 250 percent increase over 1963 use (Bratton, Hickler, and Graves 1978). Between 1967 and 1972, backcountry camping in Yosemite National Park increased 184 percent, from 78,000 to 221,000 user nights. Overnight use in the Shenandoah National Park backcountry quadrupled between 1967 and 1974; total backcountry use of Rocky Mountain National Park increased more than seven times between 1966 and 1976 (Hendee, Stankey, and Lucas 1990).

River recreation has also rapidly expanded. The history of whitewater floating on the Colorado River through the Grand Canyon is a classic example. Prior to 1960 fewer than 650 people had *ever* floated the river; 10 years later 10,000 people were floating the river *every* year. Between 1966 and 1972 the number of people floating the river increased sixteenfold, from 1,067 to 16,432 (Table 2). Since then it has continued to increase, but at a rate controlled by the number of permits issued. Leatherberry, Lime, and Thompson (1980) report that ownership of kayaks and canoes has increased much faster than ownership of other types of watercraft. Between 1973 and 1976 there was a 68 percent increase in number of canoes and a 107 percent increase in number of kayaks. This accelerating trend in river use has led public resource agencies to restrict use on many rivers. The number of rivers with use restrictions increased from 8 in 1972 to 38 in 1977 (McCool, Lime, and Anderson 1977). On some rivers the number of persons applying for a limited number of permits has been as much as 20 times the number of permits handed out. The waiting list to float through the Grand Canyon is so long that new applicants may have to wait more than 10 years for a chance to float the river. Ecological impacts on river resources can be particularly severe because use is concentrated along a narrow linear corridor.

Off-road vehicle use has also increased dramatically in recent decades. In the 1960 nationwide survey on outdoor recreation, so few people used off-road vehicles that they were not included in the survey; by 1982, 11 percent of people 12 years old and older used wheeled off-road vehicles, and 3 percent used snowmobiles (USDI National Park Service 1984). On national forest lands off-road vehicle use doubled during the 1970s to a 1979 use level of 5.3 million visitor days for wheeled vehicles and 3.3 million visitor days for snowmobiles (Feuchter, 1980). Most vehicular recreation takes place on roads; almost 50 million visitor days of recreational driving took place on national forest roads in 1979. This is fortunate because the impacts of recreational vehicles, when used off roads, are unusually severe.

The most common activity causing ecological impact in wildland recreation areas is camping, whether by people in cars and recreational vehicles or by backcountry users. According to a 1979 survey, camping ranked third, behind swimming and bicycling, among outdoor recreation activities. Cole and LaPage (1980) report that a national survey conducted in 1960 showed 3 to 4 million active camping households in the United States. This figure had grown to 12.4 million households by 1971 and to 17.5 million households by 1978. Camping grew at an average annual rate of 20 percent in the 1960s, 8 percent in the early 1970s, and less than 5 percent in the late 1970s. Much of the early interest in recreational impacts in the United States grew out of this rapid increase in camping during the 1960s.

TABLE 2. Travel on the Colorado River Through the Grand Canyon of Arizona

Year	Number of People
1867	1 ^a
1869-1940	41
1941	4
1942	8
1943	0
1944	0
1945	0
1946	0
1947	4
1948	6
1949	12
1950	7
1951	29
1952	19
1953	31
1954	21
1955	70
1956	55
1957	135
1958	80
1959	120
1960	205
1961	255
1962	372
1963-1964	44 ^b
1965	547
1966	1,067
1967	2,099
1968	3,609
1969	6,019
1970	9,935
1971	10,385
1972	16,432
1973	15,219
1974	14,253 ^c

Source: U.S. Forest Service.

^aSome contend that James White, a trapper fleeing Indians, floated through the Grand Canyon on a makeshift log raft two years before the famous expedition of John Wesley Powell.

^bTravel on the Colorado River in those years was curtailed by the completion of Glen Canyon Dam upstream and the resultant disruption of flow.

^cThe downturn in visitation was the result of the institution by management of a quota system. The numbers applying for the available permits continued to rise sharply.

CURRENT AND PROJECTED OUTDOOR RECREATION TRENDS

Several National Recreation Surveys (NRSs) have been conducted since the initial Outdoor Recreation Resources Review Commission survey of 1960. The studies since then, conducted in 1965, 1970, 1972, 1977, 1982–1983, 1987, and 1994–1995, allow for examining some current, and even projected, trends in recreation participation. Although the outdoor recreation surveys of the last 35 years are not strictly comparable, they do point to some general trends for specific activities related to wildland recreational use and resource impacts.

Comparisons of data from the 1960 and 1982 NRSs indicate that *day hiking* grew significantly in popularity between 1960 and 1982, with 14 percent of the NRS respondents participating in 1982. Data from the 1987 survey indicate that 10 days annually is the median participation per person and about 20 percent of participants go hiking more than 15 days annually. *Camping*, including backpacking, almost doubled in rate of participation between 1960 and 1982 (Cordell, Bergstrom, Hartmann, and English 1990). The 1987 survey showed that 20 percent of the recreating public camped at developed sites, with a median of 9 days annually. Another 11 percent camped in primitive campgrounds, with a median of 8 days annually. *Backpacking* involves about 5 percent of the recreating public, with a median of 7 days of annual use.

Survey data from several sources were used by Flather and Cordell (1995) to update outdoor recreation participation for the decade 1982 through 1992 (Table 3). Bicycling, day hiking, swimming, motorboating, and off-road vehicle driving continue to be popular activities. These five activities, along with developed-site camping, also have the highest frequency of participation (days of use).

More current data from the 1994–1995 survey, when compared with the 1982–1983 results (Table 4), indicate that hiking and backpacking are the second and third fastest-growing outdoor activities among persons 16 years or older (Cordell, Lewis, and McDonald 1995). Downhill skiing and primitive camping, two other wildland recreation activities, ranked fourth and fifth in growth rate during the 12-year comparison period. The activities of hiking, backpacking, and primitive camping are all closely associated with trail and campsite resources, and the fast growth of these activities is likely to have direct impacts on the quality of these resources.

Trends in wildlife-dependent activities have been mixed over the last three decades (Flather and Cordell 1995). Fishing continues to be the most popular wildlife activity, with nearly 25 percent of U.S. inhabitants participating in 1985. In contrast to the increase in number of anglers, the number of hunters has remained essentially unchanged since 1975. The stability in the total number of hunters, however, is misleading. Small game and migratory bird hunters have declined substantially since 1972, whereas the number of hunters pursuing big game species has increased during every five-year Fish and Wildlife Service survey period since 1955 (Flather and Cordell 1995, p. 5). It is speculated that big game hunting will have more impact on wildland recreation resources, since it is often associated with horse or off-road use and overnight camping. Growing faster in popularity relative to traditional wildlife and fishing pursuits are nonconsumptive wildlife-related activities (Duffus and

TABLE 3. Participation Trends for Outdoor Recreational Activities Not Dependent on Wildlife, 1982–1992

Activities	Millions of Persons \geq 12 Years Old Participating			Millions of Persons Participating \geq 10 Days in 1992
	1982–1983	1985–1987	1992	
<i>Land-based</i>				
Bicycling	60	72	86	60.3
Camping in developed campgrounds	32	40	48	13.2
Day hiking	26	32	50	13.4
Nature study/ photography	22	24/26	— ^a	— ^a
Driving motorized vehicles off-road	21	24	38	16.2
Camping in primitive campgrounds	19	22	25	6.7
Horseback riding	17	20	19	6.7
Backpacking	9	10	8	3.6
<i>Water-based</i>				
Swimming in lakes, streams, ocean	60	70	90	41.4
Motorboating	36	42	65	24.6
Waterskiing	17	20	21	7.6
Canoeing/kayaking	15	18	19	3.2
<i>Snow- and/or Ice-based</i>				
Downhill skiing	11	14	21	3.6
Snowmobiling	6	8	8	1.7
Cross-country skiing	6	8	8	2.9

Sources: 1982–1983 National Recreation Survey, USDI National Park Service; 1985–1987 Public Area Recreation Visitors Survey, USDA Forest Service; and the 1992 Pilot of the National Survey on Recreation and the Environment (unweighted data), USDA Forest Service.

^aParticipation in nature study/photography not estimated in 1992.

Dearden 1990). The number of people who actually traveled more than 1.6 km from their residences to observe, photograph, or feed wildlife increased from 22.9 to 37.5 million from 1980 to 1990.

Projections of future demand for outdoor recreation were developed from the 1987 survey data. Projections of the public's maximum preferred future demand for land, water, and snow and ice activities were estimated for each decade to the year 2040 (Table 5). Among individual activities, those projected to exhibit the most rapid rates of demand growth by the American public include downhill skiing, cross-country skiing, pool swimming, backpacking, visiting prehistoric sites, running and jogging, rafting, and day hiking. Based on projected future demand for activities that commonly occur in wildland areas and wilderness, demand increases seem evident. For

TABLE 4. Ten Fastest-Growing Outdoor Activities Among Persons 16 Years or Older in the United States 1982–1995

Activity	Number 16 Years + 1982–1983 (Millions)	Number 16 Years + 1994–1995 (Millions)	Percentage Growth
Bird-watching	21.2	54.1	155.2
Hiking	24.7	47.7	93.0
Backpacking	8.8	15.2	72.7
Downhill skiing	10.6	16.8	58.5
Primitive camping	17.7	28.0	58.2
Walking	93.6	133.6	42.7
Motorboating	33.6	46.9	39.9
Sightseeing	81.3	113.4	39.5
Developed camping	30.0	41.5	38.3
Swimming in natural waters	56.5	78.1	38.2

Source: Cordell, Lewis, and McDonald 1995.

example, backpacking is projected to grow 155 percent by the year 2040, wildlife observation and photography 74 percent, day hiking 93 percent, and general outdoor photography 105 percent (Cordell, Bergstrom, Hartmann, and English 1990).

RECENT TRENDS IN WILDLAND USE

Recent trend studies by wilderness researchers allow for assessing specific trends in wildland recreation use, users, and impacts over the last 10 to 15 years. As reported in the previous section on early recreation use, wilderness and wildland recreation use increased very rapidly during the 1960s and 1970s after establishment of the 1964 National Wilderness Preservation System. However, by the late 1980s, Lucas and several co-workers (Lucas 1989; Lucas and McCool 1988; Lucas and Stankey 1989; Roggenbuck and Watson 1988) reported a different trend. Although recreation use of the entire National Wilderness Preservation System was still increasing, they concluded that “use of individual wilderness has stabilized or is declining” (Roggenbuck and Watson 1988, p. 354) because “much of the apparent growth is accounted for by the rapid expansion in the number of wilderness units” (Lucas 1989, p. 54).

Three lines of reasoning, based on visitor-use data available through 1986, were used to arrive at this conclusion:

1. Annual growth rates in total use of all designated wilderness decreased from double-digit increases prior to the mid-1960s to a 1 percent increase in the early 1980s (Lucas and Stankey 1989).
2. Wilderness use declined on a per-acre basis between 1975 and 1986 (Roggenbuck and Watson 1988).

TABLE 5. Maximum Preferred Demand for Recreational Trips Away from Home and Indices of Future Demand Growth to 2040

Resource Category and Activity	Trips in 1987 (Millions)	Future Number of Trips as Percentage of 1987 Demand				
		2000	2010	2020	2030	2040
<i>Land</i>						
Wildlife observation and photography	69.5	116	131	146	162	174
Camping in primitive campgrounds	38.1	114	127	140	154	164
Backpacking	26.0	134	164	196	230	255
Nature study	70.8	105	113	120	131	138
Horseback riding	63.2	123	141	160	177	190
Day hiking	91.2	131	161	198	244	293
Photography	42.0	123	143	165	188	205
Visiting prehistoric sites	16.7	133	160	192	233	278
Collecting berries	19.0	113	126	143	166	192
Collecting firewood	30.3	112	124	138	157	178
Walking for pleasure	266.5	116	131	146	164	177
Running/jogging	83.7	133	163	197	234	262
Bicycle riding	114.6	125	148	173	202	222
Driving vehicles or motorcycles off-road	80.2	105	111	118	125	130
Visiting museums or info. centers	9.7	118	136	153	174	188
Attending special events	73.7	114	127	141	157	168
Visiting historic sites	73.1	122	143	169	203	241
Driving for pleasure	421.6	115	128	142	157	167
Family gatherings	74.4	119	135	152	170	182
Sightseeing	292.7	118	136	156	183	212
Picnicking	262.0	108	117	126	136	144
Camping in developed campgrounds	60.6	120	137	155	173	186
<i>Water</i>						
Canoeing/kayaking	39.8	113	126	140	157	169
Stream/lake/ocean swimming	238.8	105	110	117	124	129
Rafting/tubing	8.9	111	136	164	215	255
Rowing/paddling/other boating	61.8	112	124	136	150	159
Motorboating	219.5	106	111	117	123	127
Water skiing	107.5	111	121	131	141	148
Pool swimming	221.0	137	169	205	242	269
<i>Snow and Ice</i>						
Cross-country skiing	9.7	147	177	199	212	195
Downhill skiing	64.3	153	197	247	298	333

Source: Cordell, Bergstrom, Hartmann, and English 1990. 1985-87 Public Area Recreation Visitor Survey.

3. Use decreased during the early 1980s, both in the original Forest Service wildernesses (the core system of areas established in 1964 by the Wilderness Act) and in National Park Service backcountry. Most of these areas experienced their peak year of use prior to 1980 (Lucas and Stankey 1989).

A decade (1986–1996) of use data has accumulated since the 1980s, when it appeared that wildland recreation use was stabilizing and decreasing. Cole (1996) has analyzed the last 10 years of use data, as well as use during the period of 1965–1996. His conclusions indicate that wildland recreation use of the National Wilderness Preservation System has steadily increased during the period 1965–1996. People are recreating in designated wilderness more than ever. Recreational use of the National Wilderness Preservation System increased almost sixfold between 1965 and 1994, when recreation use approached 17 million recreation visitor-days. Most of this use occurs in wilderness managed by the Forest Service and the National Park Service (Fig. 1). The average annual increase in use over this period was 6.3 percent, and growth was remarkably constant.

Over the same period that the National Wilderness Preservation System experienced a sixfold increase in recreation use, it experienced an eightfold increase in acreage. During the 1960s and 1970s, visitor use increased more rapidly than acreage. Use intensity, measured as use per acre of the entire system, increased from 0.32 recreation visitor-days per acre in 1965 to 0.40 visitor-days per acre in 1979 (Fig. 2). After 1979, use per acre declined to 0.16 recreation visitor-days per acre in 1989 and to 0.18 recreation visitor-days per acre in 1994.

These data show a decline in recreation use per acre of the entire National Wilderness Preservation System since 1979; however, visitor use has not necessarily

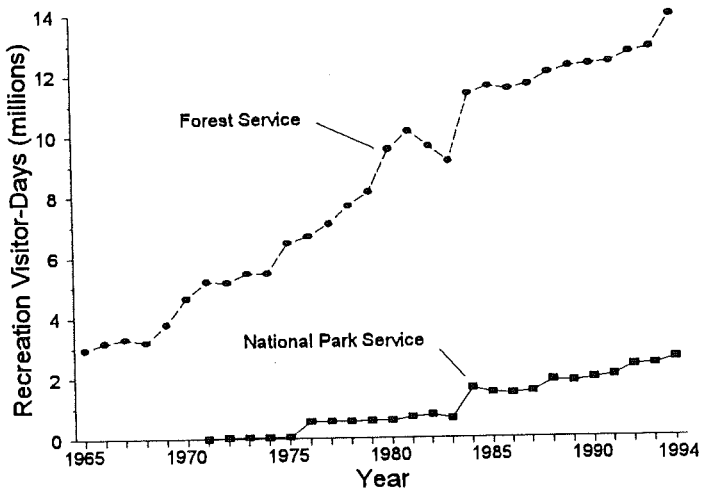


FIGURE 1. Total recreation use of Forest Service and National Park Service wildernesses. (Source: Cole 1996.)

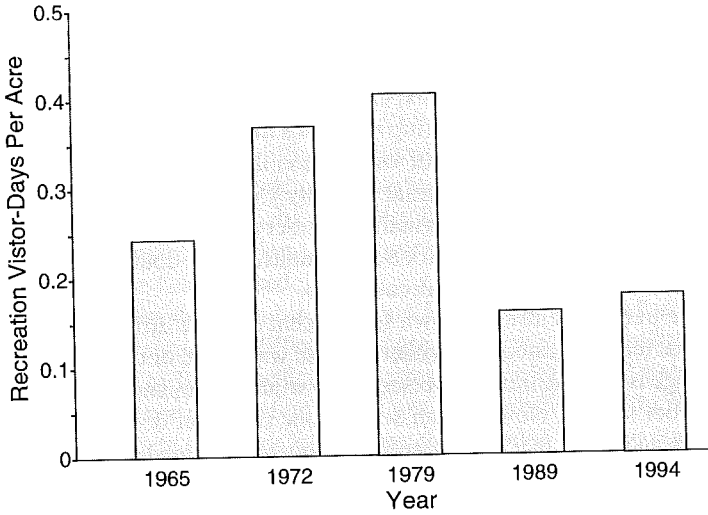


FIGURE 2. Use intensity (recreation visitor days per acre) of the National Wilderness Preservation System. (Source: Cole 1996.)

declined in any of these wildernesses. In 1980, 56 million acres of wilderness were designated in Alaska, doubling the size of the National Wilderness Preservation System overnight. But, recreational use of these lands is minimal (0.02 recreation visitor-days per acre in 1994). Excluding Alaska, the 1994 recreational use intensity was as high as it has ever been—about 0.40 recreation visitor-days per acre (Fig. 3).

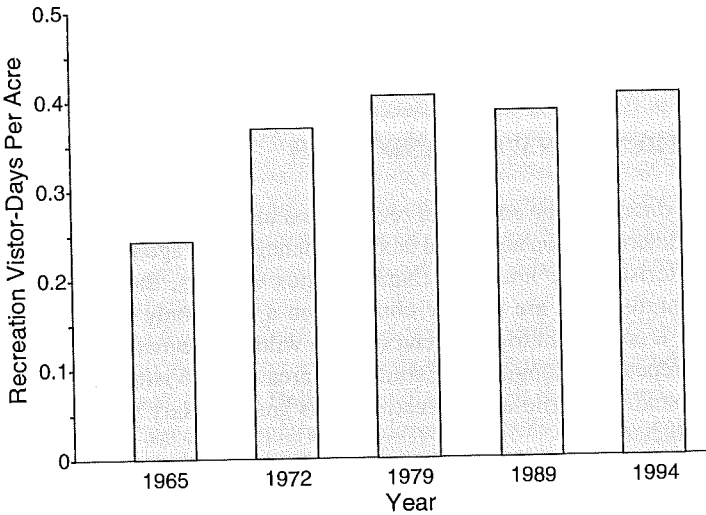


FIGURE 3. Use intensity of the National Wilderness Preservation System, excluding Alaska. (Source: Cole 1996.)

Although the size of the National Wilderness Preservation System has greatly increased since 1964 (from 54 areas and 9 million acres to 630 areas and 103 million acres today), many wildernesses are also used more heavily than ever. At least one-half of all designated wildernesses experienced their highest levels of use during the 1990s. Moreover, use increased during the 1990s in virtually every wilderness, even those that experienced high levels of visitation in the late 1970s or 1980s. The only group of areas for which a substantial majority experienced peak use prior to the 1990s was the "core" group of original Forest Service areas. Recent growth is particularly pronounced in National Park Service units, where double-digit growth rates are comparable to those of several decades ago.

These use trend conclusions drawn from recent data are different from reports in the late 1980s that suggested that wilderness use was stable or declining. One reason for this change is that use trends reversed in the wildernesses and parks that were analyzed in earlier studies. Now we can see that the period of declining use, for those wildernesses and parks that experienced declining use, ended in the late 1980s just as the reports were being written, suggesting that wilderness use was declining. Use of these areas began increasing again almost as soon as the apparent decline was identified. With the benefit of an additional 10 years of data, it now appears that the decline was limited to a brief period and to a subset of wildernesses. The prominent trend has been one of increasing use. In some areas, increases have been slow and steady; in other areas, particularly in many national parks, periods of explosive growth have been separated by a period of pronounced decline (Cole 1996).

The continued increase in use of wildland areas for recreation has many management implications. The demand for wildland recreation experiences will likely continue to grow. Consequently, avoidance of management problems associated with increased future use (crowding and associated resource damage) continues to be a valid reason for designating additional wilderness and managing it within a limit of acceptable change framework. Part IV of this book will deal in more detail with the management implications of increased use and the resulting resource impacts.

RECENT TRENDS IN WILDLAND USERS

Although estimates of the amount of recreational use occurring in wildland areas are commonly determined on an annual basis by management agencies, data concerning user characteristics are not. The characteristics of users, their use patterns, and behavioral preferences are usually obtained on a case-study and, often, one-time basis. Thus, it is difficult to find trend data on wildland recreation users because of the lack of repeat and longitudinal studies of area users. Visitor surveys that replicate earlier studies of wildland recreation users are necessary before trend analyses can be conducted.

To better understand trends among wilderness visitors, Cole, Watson, and Roggenbuck (1995) replicated three earlier visitor use surveys in the Boundary Waters Canoe Area Wilderness, Minnesota, in the Shining Rock Wilderness, North Carolina, and in the Desolation Wilderness, California. The years 1969 and 1991

were compared in the Boundary Waters, 1978 and 1990 in Shining Rock, and 1972 and 1990 in Desolation. Prior to these three visitor trend studies there had been only one detailed visitor trend study—that of visitors to the Bob Marshall Wilderness Complex, Montana, in 1970 and 1982 (Lucas 1985). Results of the three studies were compared with the earlier study of the Bob Marshall visitors. These case studies provide examples from four different regions of the United States with substantial wilderness acreage and include one canoe wilderness and one wilderness with substantial stock use. However, the examples do not vary much in use intensity. Although the Bob Marshall Wilderness Complex is relatively lightly used, the three other wildernesses are heavily used.

The earlier Bob Marshall trend study found few differences in characteristics of visitors. The most pronounced differences were as follows: more hikers relative to horse and mule users in 1982, smaller party sizes, shorter lengths of stay, less use of outfitters, more summer use relative to fall use, a wider distribution of use across trailheads, some shift in activities from more consumptive to more contemplative, and less dependence on wood fires in 1982. The data also showed an increase among 1982 visitors in the proportion of women, education levels, professional and technical occupations, and a decrease in amount of previous experience in the Bob Marshall Wilderness Complex. Visitors in 1982 were more concerned about crowding, conflict, and poor trails and were less able to find their desired level of campsite solitude. They were more likely than 1970 visitors to feel that soil and vegetation impacts were a problem and less likely to feel that litter was a problem.

These findings have been cited in an attempt to generalize about overall trends in wilderness use. For example, Roggenbuck and Lucas (1987) suggest that there may be a trend toward fewer wilderness impacts per party, and Roggenbuck and Watson (1988) suggest that groups are getting smaller and stays are getting shorter. However, these changes may be unique to the Bob Marshall Wilderness Complex, which is an unusual area in a number of ways: it is one of the largest wilderness complexes outside Alaska and is unusual in the amount of horse, outfitter, and hunting use it receives.

Another long-term visitor study in a wilderness-like (wildland) area was conducted in the backcountry of the Great Smoky Mountains National Park in 1973 and 1983 (Burde and Curran 1986). As in the Bob Marshall study, recent visitors were older, more likely to be female, and visited in smaller parties. In contrast to those in the Bob Marshall study, recent visitors to the Great Smoky Mountains National Park had more experience with wilderness, were more likely to be family groups, and had no change in length of stay.

The recent trend analysis by Cole, Watson, and Roggenbuck (1995) of visitors to three wilderness areas allows for a synthesis and summary of trend differences among these three areas and the Bob Marshall and Great Smoky areas. An attempt was made to identify trends that might be widespread across the National Wilderness Preservation System. Realizing the limitations of generalizing about overall wilderness trends from a small number of case studies, the authors categorized the trends into five classes, based on strength and consistency of trends across the five study areas (Table 6).

TABLE 6. Strength and Consistency of Trends Across Five Wildernesses for 63 Variables*Strong Consistent Trends*

Older visitors; higher educational attainment; more females; more visitors who have been to other wildernesses; better ratings for litter conditions.

Weak Consistent Trends

Increased income; fewer first-time wilderness visitors; visitors were older when they first visited wilderness; more solo visitors; smaller groups; fewer organized groups; shorter overnight stays; more day use; less fishing; more mountain climbing; use more concentrated in summer; higher total encounter rates; less support for low-standard trails and leaving a few trees blown down across the trail; more support for high-standard trails, bridges over creeks, bridges over rivers, natural lightning fires, packing unburnable garbage out of the wilderness, prohibiting wood fires where dead wood is scarce, and limiting the size of visitor groups.

Variables That Did Not Change

Population of current residence; days spent in wilderness in the past year; proportion of visitors who hike, photograph, and swim; off-trail travel; number of campsite encounters; ability to find preferred level of campsite solitude; ratings of "wear and tear;" support for outhouses, cement fireplaces, interpretive signs, a natural fishery, and restricting use if area is overused.

Weak Inconsistent Changes

Number of wilderness visits in the past year; typical frequency of wilderness visits; proportion of groups with family members; proportion of hiking groups; distance traveled; number of different campsites used; concentration of use on weekends; concentration of use at certain trailheads; overall trip quality ratings; visitor opinions about the number of other people they encountered; preferred campsite encounter rates; visitor support for trailless areas, fire rings, assigning campsites, and administrative use of chain saws.

Strong Inconsistent Changes

Proportion of visitors who are students and members of conservation organizations; first-time visitors to the specific wilderness; number of previous visits to the specific wilderness; proportion of visitors who hunt and study nature; number of encounters with large groups; relationship between satisfaction estimates and hypothetical encounter rates.

Source: Cole, Watson, and Roggenbuck 1995.

Conclusions Drawn from Trend Synthesis

As can be seen from the categories in Table 6, there was considerable variation in user trends across the five wilderness areas. For example, only 5 of the 63 variables assessed exhibited strong and consistent trends. Rather than a detailed discussion of trends, a summary of conclusions drawn from the synthesis of trend differences is offered.

All Wildernesses Are Not Alike. The lack of substantial consistent change in trend variables across the five wildernesses suggests that every area can be unique and that it is dangerous to generalize about trends across the entire wilderness system. Study results for one wilderness at one point in time may be site specific and of limited value beyond that wilderness.

Visitors Have Changed More Than Their Visits. The characteristics of wilderness visitors changed more than the types of trips they took, their use patterns during trips, and their evaluation of conditions they encountered. Today's visitors are generally older, more highly educated, more likely female, and more likely to be day users than in the past. The increase in day users, particularly in some wildernesses, indicates that solo visitors are more common, groups are smaller, and stays are shorter. However, trend data for all wilderness areas seem to indicate that there has been little substantial change in group size (two to four people) and length of stay (one to three nights) over the last 20 years.

Perceptions of Impact Conditions Basically Unchanged. Although evidence for the study areas indicates that current visitors consistently feel that litter is a less severe problem, there is little similar evidence regarding interparty contacts and impact potential of groups. Virtually everyone supports the "pack out your garbage" policy, and it seems to work. However, there is no clear evidence that today's wilderness visitors are any more or less tolerant of encounters with others than their predecessors. But, again, this finding varies with the specific area studied. Current Shining Rock visitors felt that "too many people" was less a problem than their predecessors did, despite encountering more people. Reported satisfaction also decreased more slowly, with increasing numbers of encounters, in 1990 than in 1978. All these results suggest an increased tolerance for frequent interparty encounters. At Desolation, the tolerance of day users was higher than that of overnight visitors; moreover, the tolerance of day users increased over time, but the tolerance of overnight visitors was unchanged. These differences between day and overnight visitors suggest that the increased tolerance of Shining Rock visitors may simply reflect an increase in day use in that area. Finally, the tolerance of Boundary Waters visitors decreased over time. Current visitors are more likely to consider the area crowded, despite no significant change in number of encounters. Moreover, reported satisfaction declined much more rapidly with increasing numbers of encounters in 1991 than in 1969.

Users of Desolation, Boundary Waters, and Shining Rock were not optimistic that a shift toward the use of low-impact behaviors was occurring. Use concentration remains high in these wildernesses, and trip and group characteristics remain largely unchanged. However, evidence of more people using stoves, packing out litter, and using some other basic low-impact practices is a promising trend.

Inconsistent and Declining Attitudes. Many wilderness areas are currently involved with management of natural fires and natural fisheries (no stocking and leaving barren lakes alone) in natural wilderness ecosystems. Early studies showed that visitors considered both practices undesirable. The follow-up studies in two of the wildernesses

(Bob Marshall and Desolation) showed that visitors still reject the idea of natural fisheries; however, attitudes in support of natural fires have increased dramatically. This suggests that visitors will support the goal of preserving natural conditions in wilderness ecosystems, but perhaps only when this does not disrupt their preferred activities. Current attitudes also tend to support high-standard trails and bridges over creeks more than the purist attitudes found in the earlier studies. For example, there were significant increases in concern about poor trail maintenance, poor trail marking, and inadequate information about trail locations in the Shining Rock area. Increased day use in Shining Rock may have led to a reduction in self-reliance and more interest in easy access and travel within the wilderness.

Some Management Cautions. The vast majority of today's visitors to the five study areas were very satisfied with their trips, just as in the past. However, because so few of the trend variables changed consistently across the five wildernesses, it is difficult to attribute the satisfaction level to specific trends. It is also very dangerous to extrapolate results from one wilderness to another. It may be possible, however, to identify groups of wildernesses for which trends are likely to be relatively similar. For example, many heavily day-used wildernesses close to large urban areas with universities may change in similar ways.

The finding that day-users are often quite different from overnight users and that day use is increasing, at least in some areas, is of importance. Day users have seldom been studied; they are seldom monitored; and their use is frequently uncontrolled. Managers of wildernesses with substantial amounts of day use would be wise to pay more attention to these users and their impacts.

The observation that people who come to wildernesses have changed, without a pronounced shift in the kinds of trips that visitors take or in their preferences for the conditions they encounter, must also be interpreted with caution. This finding can be partially explained as changes in the sociodemographic characteristics of visitors who keep coming to wildernesses. For example, visitors in 1972 who kept returning to Desolation would be older in 1990 and less likely to be students. Alternatively, this finding might suggest that wilderness visit characteristics and visitor attitudes and management preferences can remain stable despite pronounced shifts in the kinds of people who visit wildernesses (such as more women).

RECENT TRENDS IN WILDLAND IMPACTS

Wildland recreation impacts, unlike wildland recreation use, are seldom estimated on an annual basis and therefore do not lend themselves as well to trend analyses. Only within the last 10 to 15 years have empirically based impact studies been replicated so that impact changes over time could be examined. These studies have concentrated on trail and campsite impact trends within wilderness and other wildland areas.

Although a number of studies of trail and campsite impacts have been conducted (Cole 1987), most studies have assessed conditions at only one point in time. They provide a "snapshot" of conditions, but little perspective on how conditions are

changing over time. Although it is true that many wildland recreation management areas commonly monitor impact conditions on a periodic basis, these data are seldom subjected to trend analysis or published. We can assume from the amount of trail and campsite maintenance and reconstruction done every year that deterioration is occurring; however, we have little quantitative information about trends in impact condition in wildland areas (Cole 1991).

Trail Impact Trends

Four studies of change over time on trail systems have been conducted in wildland areas (Cole 1991). Studies by Bayfield (1985, 1986) and by Lance, Baugh, and Love (1989) have been conducted in wild areas in Scotland. Data on changes in trail width are available for periods of as much as 12 years. These investigators found that many trails increased in width, but some trails were relatively stable. Generally, newly developed trails and those experiencing increased use were most subject to change. In Rocky Mountain National Park, Colorado, Summer (1980, 1986) also found considerable variation in response between trails over 7 years; four of nine trail segments widened substantially, whereas the others were generally stable. Two of five segments deepened substantially. Summer (1980) found that new trails were particularly prone to deterioration and that extent of deterioration was often related to terrain characteristics.

Fish, Brothers, and Lewis (1981) and Tinsley and Fish (1985) studied trail erosion in Guadalupe Mountains National Park, Texas. Over a 3.5-year period, little net erosion occurred. Some trail segments experienced erosion, and others experienced deposition. The net effect was not significantly different from what was occurring off-trail. A similar result was reported by Cole (1983) in a study of 2 years of change on a trail in the Selway-Bitterroot Wilderness, Montana.

Cole (1991) extended his initial 2-year Selway-Bitterroot Wilderness study to cover an 11-year period, 1978–1989. Over the 11-year period, changes in trail depth were not significant. Individual trail locations were prone to change, but the trail system as a whole was relatively stable. There was virtually no net erosion or deposition. Total trail width, a measure of the width of the zone disturbed by trampling, did increase. However, bare trail width (a measure of the zone devoid of vegetation) did not change significantly. These results suggest greater change at the periphery of the trail corridor—increasing total width—than in the central portion of the trail zone.

The finding that trail width varied more than depth, with amount of use, is not surprising. Trampling is the primary agent of trail widening, whereas the primary agent of deepening is running water. Consequently, the critical factors that influence depth are more likely to be related to environment (for example, soil characteristics or slope steepness) rather than use.

Campsite Impact Trends

Wilderness managers cite campsite deterioration as a problem more than any of the other potential problems in wilderness (Washburne and Cole 1983). Camping in natural and wildland areas commonly causes locally severe impacts, particularly on the vegetation

and soils at destination sites. Many campsites have lost virtually all ground cover vegetation and tree reproduction; organic soil horizons have been lost, and exposed mineral soil has been severely compacted. Although there is information on campsite conditions in wildland areas, few data are available on the changes in campsite conditions over time. However, change on established campsites over time is only one of the pieces of information needed to evaluate change in campsite condition. Campsite impact is a function of both the number of campsites and the condition of these sites. If the number of campsites increases greatly over time, campsite impact problems will increase dramatically even if the conditions of the original sites are relatively stable or unchanged. Thus, a review of trends in campsite impacts must include both change over time of existing campsite conditions and the proliferation of new impacted areas over time.

Established Campsite Impacts. The results of studies on impact changes of established campsites over periods of 5 to 11 years present a complex picture (Cole and Hall 1992; Merriam and Peterson 1983). Some campsites improve, other deteriorate, and other remain relatively stable. Even on the same campsite, some impacts may increase while others diminish. The types of impact that tend most frequently to increase over time are campsite expansion (size of area), exposure of mineral soil, and cumulative damage to trees. In contrast, study results indicate that impacts to ground cover vegetation tend to decline or stabilize. However, the overall trend for four wilderness areas studied to date is one of slight deterioration on established campsites (Cole and Hall 1992; Merriam and Peterson 1983).

Researchers have also compared changes on high-use and low-use sites, and on sites that were no longer being camped on. Over time, with few exceptions, high-use sites either deteriorated or were stable. The findings for low-use sites were more variable. Certain low-use sites deteriorated as much as the high-use sites, but others improved substantially (Cole and Hall 1992). Concerning sites no longer used, more highly impacted sites tended to recover more slowly than lightly impacted sites, depending on previous impact level and on environmental recovery characteristics.

Cole and Hall (1992) draw two conclusions from their work on campsite impact trends—that established sites tend to deteriorate slowly and that closed sites recover at variable rates. This information can be added to previous research on impact changes to suggest the following typical campsite “life history” (Fig. 4).

As a campsite first develops, deterioration is rapid, often reaching near-maximum levels of impact after a few years of use. This “development” phase is followed by a more stable phase during which deterioration continues but at a much slower rate. Campsite expansion, tree damage, and mineral soil exposure are the impacts that most frequently continue to increase during this phase. If a site is effectively closed to use, recovery will occur. The rate of recovery is variable, but always slower than the rate of deterioration. Recovery will occur more rapidly where growing conditions are more favorable and on sites that were not severely impacted.

The authors further conclude that the results of trend studies give little reason to be either optimistic or pessimistic about the future condition of established campsites. There is a lack of evidence to suggest that established campsites are much worse than they were a decade ago. Many wilderness campsites have been severely impacted for

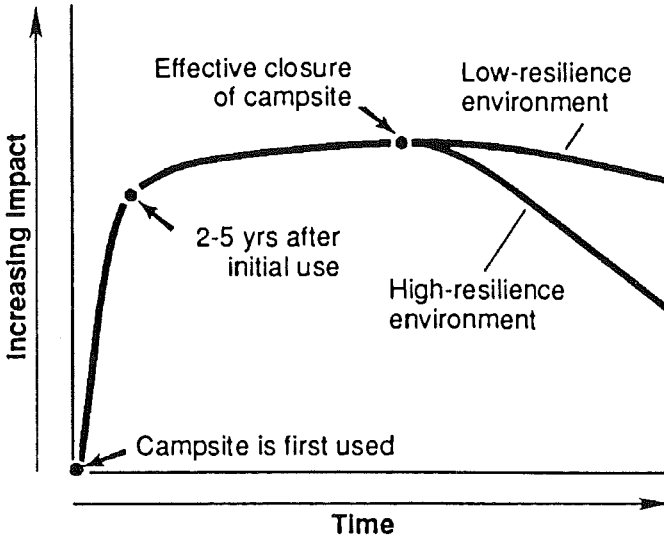


FIGURE 4. The "life history" of a typical campsite. (Source: Cole and Hall 1992.)

decades. Continued use of these sites may cause further deterioration, but at rates that are low when compared with the impact that has already occurred. However, there is also little likelihood that management can do much to improve the condition of these sites without drastic restrictions on use.

New Campsite Impacts. The establishment and proliferation of new campsites is a major concern of wildland recreation managers, particularly over extended time periods. Cole (1993) reports on changes in the number and condition of campsites over a 12- to 16-year period in portions of three wildernesses. The number of campsites increased 53 percent in the Selway-Bitterroot, 84 percent in the Lee Metcalf, and 123 percent in the Eagle Cap. The study showed that campsite impact increased substantially, not because existing campsites had deteriorated, but primarily because new campsites were developed. For example, in the Bear Creek drainage of the Selway-Bitterroot Wilderness, 16 new campsites were created and 13 sites remained stable, while only 5 sites deteriorated during a 12-year period (Fig. 5).

Based on the research of established campsite impacts and of newly established sites, Cole concluded that if these study areas are typical of other wilderness areas—and there is little reason to suspect they are not—campsite impacts may have increased substantially in other wildland areas over the past 10 to 15 years. The primary reason impact has increased is the creation of new campsites, even though the condition of some established sites has deteriorated.

The magnitude of the trend increase in number of new campsites suggests that an increase in site-pioneering behavior (i.e., campers creating new campsites) has occurred. In the Spanish Peaks Wilderness, for example, the number of new campsites

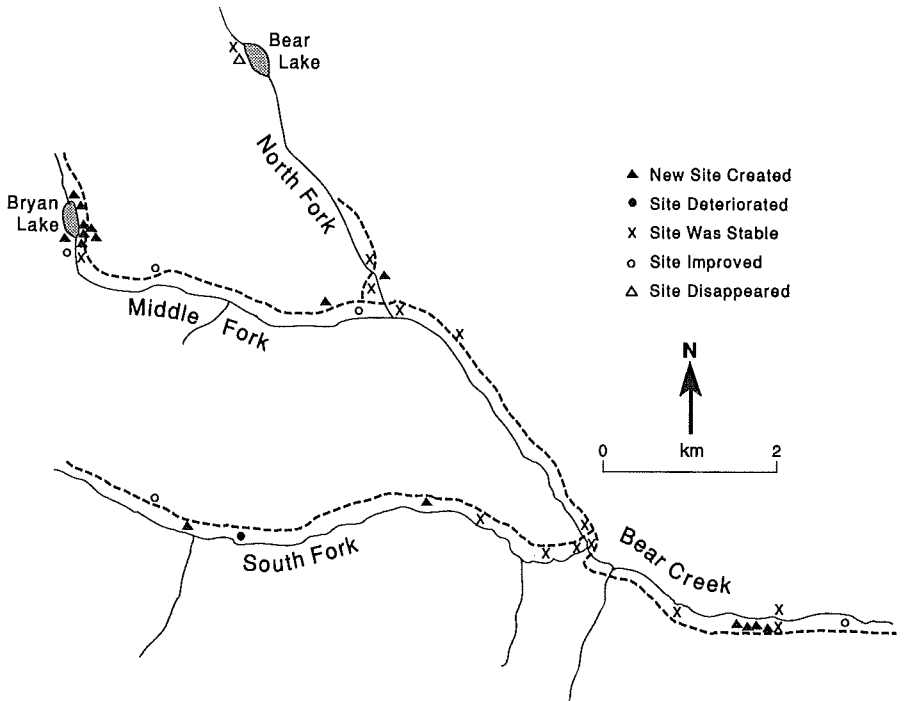


FIGURE 5. Changes in campsite condition in the Bear Creek drainage, Selway-Bitterroot Wilderness, MT, between 1977 and 1989. During the 12-year period, 16 new campsites were created, 13 sites were stable, 5 sites improved, 1 site deteriorated, and 1 site disappeared. (Source: Cole 1993.)

created between 1972 and 1988, a period of relatively stable use, almost equals the number created during the many decades of increasing use that preceded 1972. Site densities at some low-use lakes currently exceed the densities that existed at high-use lakes in the mid-1970s, even though use levels are thought to have been stable since the mid-1970s. These changes are too dramatic to simply reflect the passage of time. They suggest that campers today are much more likely to pioneer a new campsite than they were 15 to 20 years ago.

The interpretation suggests that campsite proliferation over the past 10 to 15 years is primarily a result of (1) an increase in site-pioneering behavior, in many cases with the encouragement of management, and (2) passive management programs that do little to attempt to decrease the number of campsites. These problems tend to be more severe in more heavily used places. But as campsite density increases, fewer potential campsites have never been used. Consequently, the risk of proliferation may be relatively low at very heavily used places because they have few suitable sites that have never been used. The places most at risk today are the regularly used destination areas with numerous potential campsites that have never been used.

SUMMARY

1. This chapter has reviewed trends in wildland recreation use and impacts over the last 20- to 40-year period, depending on the length of time for which data were available. The major changes over time indicate that overall wildland and wilderness use is increasing. However, individual wildernesses vary greatly, with use decreasing in specific areas.

2. Although amount of use is changing, the use patterns of visitors are fairly stable. Increases in day use and number of females using wilderness are the major visitor changes.

3. Impacts to wildland resources have also increased over time. Perhaps the most relevant change for managers is the proliferation of new campsites in wildland areas. Managers should be concerned about this type of impact and should develop strategies to reduce it. As more long-term and repeat study data become available to document trends in use and impacts, wildland managers will have to improve management of these changes.

REFERENCES

- Bayfield, N. G. 1985. The Effects of Extended Use on Mountain Footpaths in Britain. In *The Ecological Impacts of Outdoor Recreation on Mountain Areas in Europe and North America*. Recreation Ecology Research Group Report No. 9. Wye, UK: Wye College, pp. 100–111.
- Bayfield, N. G. 1986. Penetration of the Cairngorm Mountains, Scotland, by Vehicle Tracks and Footpaths: Impacts and Recovery. In R. C. Lucas, comp. *Proceedings—National Wilderness Research Conference: Current Research*. USDA Forest Service General Technical Report INT-212, Ogden, UT, pp. 121–127.
- Bratton, S. P., M. G. Hickler, and J. H. Graves. 1978. Visitor Impact on Backcountry Campsites in the Great Smoky Mountains. *Environmental Management* 2:431–442.
- Burde, J. H., and K. A. Curran. 1986. User Perception of Backcountry Management Policies at Great Smoky Mountains National Park. In D. L. Kulhavy and R. N. Conner, eds. *Wilderness and Natural Areas in the Eastern United States: A Management Challenge*. Nacogdoches, TX: Center for Applied Studies, School of Forestry, Stephen F. Austin State University, pp. 223–228.
- Cole, D. N. 1983. Assessing and Monitoring Backcountry Trail Conditions. USDA Forest Service Research Paper INT-303. 10 pp.
- Cole, D. N. 1987. Research on Soil and Vegetation in Wilderness: A State-of-Knowledge Review. In R. C. Lucas, comp. *Proceedings—National Wilderness Research Conference: Issues, State-of-Knowledge, and Future Directions*. USDA Forest Service General Technical Report INT-220, Ogden, UT, pp. 135–177.
- Cole, D. N. 1991. Changes on Trails in the Selway-Bitterroot Wilderness, Montana, 1978–89. USDA Forest Service Research Paper INT-450. 5 pp.
- Cole, D. N. 1993. Campsites in Three Western Wildernesses: Proliferation and Changes in Condition over 12 to 16 Years. USDA Forest Service Research Paper INT-463. 15 pp.

- Cole, D. N. 1996. Wilderness Recreation Use Trends, 1965 Through 1994. USDA Forest Service Research Paper INT-RP-448. 10 pp.
- Cole, D. N., and T. E. Hall. 1992. Trends in Campsite Condition: Eagle Cap Wilderness, Bob Marshall Wilderness, and Grand Canyon National Park. USDA Forest Service Research Paper INT-453. 40 pp.
- Cole, D. N., A. E. Watson, and J. W. Roggenbuck. 1995. Trends in Wilderness Visitors and Visits: Boundary Waters Canoe Area, Shining Rock, and Desolation Wildernesses. USDA Forest Service Research Paper INT-RP-483. 38 pp.
- Cole, G. L., and W. F. LaPage. 1980. Camping and RV Travel Trends. In W. F. LaPage, ed. *Proceedings 1980 National Outdoor Recreation Trends Symposium*. USDA Forest Service General Technical Report NE-57, pp. 165-178.
- Cordell, H. K., J. C. Bergstrom, L. A. Hartmann, and D. B. K. English. 1990. An Analysis of the Outdoor Recreation and Wilderness Situation in the United States: 1989-2040. USDA Forest Service General Technical Report RM-189.
- Cordell, H. K., B. Lewis, and B. L. McDonald. 1995. Long-term Outdoor Recreation Participation Trends. In J. L. Thompson, D. W. Lime, B. Gartner, W. M. Sames, comps. *Proceedings of the Fourth International Outdoor Recreation and Tourism Trends Symposium and the 1995 National Recreation Resources Planning Conference*. St. Paul: College of Natural Resources and Minnesota Extension Service, University of Minnesota, pp. 35-38.
- Duffus, D. A., and P. Dearden. 1990. Non-consumptive Wildlife-Oriented Recreation: A Conceptual Framework. *Biological Conservation* 53:213-231.
- Fish, E. B., G. L. Brothers, and R. B. Lewis. 1981. Erosional Impacts of Trails in Guadalupe Mountains National Park, Texas. *Landscape Planning* 8:387-398.
- Feuchter, R. 1980. Off-road Vehicle Use: The U.S. Forest Service Perspective. In R. N. L. Andrews, and P. F. Nowak, eds. *Off-road Vehicle Use: A Management Challenge*. Washington, DC: Office of Environmental Quality, pp. 148-155.
- Flather, C. H., and H. K. Cordell. 1995. Outdoor Recreation: Historical and Anticipated Trends. In R. L. Knight and K. J. Gutzwiller, eds. *Wildlife and Recreationists*, Washington, DC: Island Press, pp. 3-16.
- Hendee, J. C., G. H. Stankey, and R. C. Lucas. 1990. *Wilderness Management*. 2d ed. Golden, CO: North American Press. 546 pp.
- Lance, A. N., I. D. Baugh, and J. A. Love. 1989. Continued Footpath Widening in the Cairngorm Mountains, Scotland. *Biological Conservation* 49:201-214.
- Leatherberry, E. C., D. W. Lime, and J. L. Thompson. 1980. Trends in River Recreation. In W. F. LaPage, ed. *Proceedings 1980 Outdoor Recreation Trends Symposium*. USDA Forest Service General Technical Report NE-57, pp. 147-164.
- Lucas, R. C. 1985. Visitor Characteristics, Attitudes, and Use Patterns in the Bob Marshall Wilderness Complex, 1970-82. USDA Forest Service Research Paper INT-345. 32 pp.
- Lucas, R. C. 1989. A Look at Wilderness Use and Users in Transition. *Natural Resources Journal* 29:41-55.
- Lucas, R. C., and S. F. McCool. 1988. Trends in Wilderness Recreational Use: Causes and Implications. *Western Wildlands* 14(3):15-20.
- Lucas, R. C., and G. H. Stankey. 1989. Shifting Trends in Wilderness Recreational Use. In A. E. Watson, comp. *Outdoor Recreation Benchmark 1988: Proceedings of the National*

- Outdoor Recreation Forum*. USDA Forest Service General Technical Report SE-52, pp. 357–367.
- McCool, S. F., D. W. Lime, and D. H. Anderson. 1977. Simulation Modeling as a Tool for Managing River Recreation. In *Proceedings: River Recreation Management and Research*. USDA Forest Service General Technical Report NC-28, pp. 304–311.
- Merriam, L. C., and R. F. Peterson. 1983. Impacts of 15 Years of Use on Some Campsites in the Boundary Waters Canoe Area. Agricultural Experiment Station Research Note 282, University of Minnesota: St. Paul. 3 pp.
- Roggenbuck, J. W., and R. C. Lucas. 1987. Wilderness Use and User Characteristics: A State-of-Knowledge Review. In R. C. Lucas, comp. *Proceedings—National Wilderness Research Conference: Issues, State-of-Knowledge, and Future Directions*. USDA Forest Service General Technical Report INT-220, Ogden, UT, pp. 204–245.
- Roggenbuck, J. W., and A. E. Watson. 1988. Wilderness Recreation Use: The Current Situation. In A. E. Watson, comp. *Outdoor Recreation Benchmark 1988: Proceedings of the National Outdoor Recreation Forum*. USDA Forest Service General Technical Report SE-52, pp. 346–356.
- Stankey, G. H. 1973. Visitor Perception of Wilderness Recreation Carrying Capacity. USDA Forest Service Research Paper INT-142. 61 pp.
- Summer, R. M. 1980. Impact of Horse Traffic on Trails in Rocky Mountain National Park. *Journal of Soil and Water Conservation* 35:85–87.
- Summer, R. M. 1986. Geomorphic Impacts of Horse Traffic on Montana Landforms. *Journal of Soil and Water Conservation* 41:125–128.
- Tinsley, B. E., and E. B. Fish. 1985. Evaluation of Trail Erosion in Guadalupe Mountains National Park, Texas. *Landscape Planning* 12:29–47.
- USDI National Park Service. 1984. The 1982–1983 Nationwide Survey: Summary of Selected Findings. National Park Service, Washington, DC.
- Washburne, R. F., and D. N. Cole. 1983. Problems and Practices in Wilderness Management: A Survey of Managers. USDA Forest Service Research Paper INT-304. 56 pp.