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## **Section 3. State-of-Knowledge for Wilderness User Research**

# WILDERNESS USE AND USER CHARACTERISTICS: A STATE-OF-KNOWLEDGE REVIEW

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## ABSTRACT

*Understanding wilderness use and users is essential for effective wilderness management, most of which is management of recreational use. Use and user research is less common now than a decade or two ago, although problems have multiplied and intensified as the wilderness system has expanded.*

*Similarities in use and especially users are more common than difference. Young adults, males, highly educated people, professional and technical occupations, moderately high incomes, predominantly local and regional visitors, low membership in conservation organizations, urban residents, considerable previous experience, and family groups are common characteristics. Use is distributed unevenly among areas, within areas, and over time. Parties typically are small, hiking, without outfitters, staying only a few days (or just for the day), and engage in multiple activities, with hiking, fishing, and photography most common.*

*The rate of increase in wilderness use has slowed, and use has declined in many areas. Use appears to be becoming more evenly distributed within many wildernesses with less pronounced peaks at certain times, stays are becoming shorter, parties are becoming smaller, there are more women visitors, and more visitors are visiting wildernesses not previously visited. The limited number of studies reporting data on these factors and noncomparability of measures and research methods require caution. Projections vary widely, although all project increasing use.*

*Research is needed to develop use measurement technology. Research needs to cover neglected areas and use outside the summer or summer and fall seasons, and be updated. Trends need emphasis, and longitudinal research is essential. A less cumbersome review and approval process is needed for research and monitoring. General population studies are needed as well as onsite visitor surveys. Visitors' knowledge of low impact use needs to be studied.*

## INTRODUCTION

### Importance of the Topic

The importance of understanding wilderness use and user characteristics lies in the recognition that many of the important benefits of and threats to wilderness stem from wilderness use. The Wilderness Act (PL 88-577) specifies that the overriding value of wilderness is the protection of natural processes over a fairly large, undeveloped, and unoccupied area. However, the act recognizes that the protection of pristine areas is not an

end itself. Instead, wilderness is "to secure for the American people of present and future generations the benefits of an enduring resource of wilderness," and areas "shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness." The act goes on to specify in general terms what these user benefits are. Wilderness areas are to provide "outstanding opportunities for solitude or a primitive and unconfined type of recreation. . .and may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."

The Wilderness Act specifies in general terms the bounds of appropriate wilderness uses and benefits. However, more precise definitions are needed when wilderness allocation decisions are made, wilderness policy is developed, and management plans are written. Wilderness allocations are made in an arena of competing demands among potential uses of an area's resources. Undeveloped lands might be classified as wilderness, but they might also be used to meet the Nation's needs for energy, timber, or roaded recreation experiences. When such decisions are made, resource planners, the President, and the Congress need information on use patterns and how wilderness users define "solitude and primitive and unconfined recreation." They need to know what social, psychological, and economic benefits are gained, or lost, when lands are set aside as wilderness. They need to know who receives these benefits, where, and how. What are the trends in wilderness use? Is the number of beneficiaries growing or declining? Are some wilderness values increasing in importance while others are declining? The wilderness user can help answer these important questions.

Once wildernesses have been established, use and user information is a prerequisite to the preparation of sound management plans. Hendee and others (1978) have suggested a goal-achievement framework for wilderness management planning that calls for the statement of goals, objectives, current situation and assumptions, and management mechanisms. Knowing the current situation and trends in such variables as amount of use, methods of travel, timing of use, travel patterns, length of stay, and group size greatly facilitates the specification of feasible objectives and selection of management mechanisms to achieve them. User opinions are an important source of input to the development of objectives. Such user data as place of residence can help resource planners and managers locate important clientele groups and effectively plan public involvement and education programs.

Accurate information on use and users is important for the management of wilderness for two reasons. First,

wilderness management must for the most part be visitor management, because many other recreation management strategies are inappropriate. For example, site manipulation, site hardening, and facility development to prevent or mitigate impacts appear to conflict with the wilderness mandate for naturalness (Lucas 1982). Second, studies of wilderness users have consistently shown that freedom, spontaneity, and escape are highly sought values. Therefore, while visitor management is necessary, that management must be subtle, lighthanded, and unobtrusive (Lucas 1980, 1982; Wuerthner 1985). The wilderness manager must make every effort to permit users' freedom of choice-freedom at levels not necessarily found at less primitive outdoor recreation settings. This suggests that such authoritarian regulations as assigned departure times, entry points, travel routes, and campsites are generally inappropriate in wilderness. Instead, the manager might use access design and information, communication, and persuasion to modify behavior (Lucas 1981). Such management strategies require much more complete knowledge of use patterns, timing of use, and the attractions that draw visitors.

Information on use and users is also important in identifying causes and solutions of social and ecological impacts in wilderness. The relationship between amount of use and visitor-caused social and ecological impacts is not a linear one and depends on use characteristics as much or more than amount of use (LaPage 1967; Helgath 1975; Cole 1982). In explaining social impacts, and probably wildlife impacts as well, timing of use is often more important than amount of use; and visitor behavior, party size, and travel methods are more important than total use (Stankey 1973; Lee 1975).

Large increases in the number of wildernesses and the number of acres add to the importance of use and user research. From 55 areas, with 9 million acres, almost all in western States, all managed by one agency in 1964, the wilderness system has grown to 444 areas, with 89 million acres, in 44 States, managed by four agencies in 1984.

In summary, understanding use and user characteristics has value in itself, but it is also a key element in understanding many other dimensions of the wilderness social service system. By itself, knowledge of basic visitor characteristics permits an understanding of who, how many, when, where, and by what means people receive benefits from the wilderness. In addition, such visitor information can help wilderness policymakers, managers, and researchers understand the distribution of wilderness benefits among clientele groups, the behavior of users, and the causes and potential solutions to visitor-caused social and ecological impacts. When such visitor information is lacking for certain wildernesses or for large regions of the country, for certain seasons of the year, for certain user groups, or for key visitor characteristics, decisions must be based largely on intuition. Better knowledge of visitor characteristics increases the professionalism of wilderness management and can improve the quality of visitor experiences.

## Scope of the Topic

Use and user characteristics relevant to wilderness allocation, planning, management, and research can be categorized roughly into five general areas: (1) basic demographic descriptions of visitors; (2) number and characteristics of visits, (3) motives for and benefits of use; (4) perceptions, attitudes, and behavior of visitors; and (5) trends and projections in use and user variables. In addition, knowledge of measurement methods is needed to obtain valid and reliable data on these use and user characteristics.

The scope of this paper is limited to research focusing on methods for collecting wilderness use and user data, basic demographic descriptions of wilderness visitors, characteristics of wilderness visits, trends and projections of use and users, and needs for additional use information. These basic user variables are closely related to motives for visiting wilderness, reasons for participating in various activities in wilderness, perceptions of conditions and experiences in wilderness, and wilderness attitudes and behavior. Motives, perceptions, attitudes, and behavior are often included in summaries of visitor surveys, but are omitted here. Stankey and Schreyer cover visitor attitudes and behaviors, and Driver, Haas, and Nash summarize wilderness benefits in separate papers in this volume. In addition, our summary is based almost entirely on published research reports, proceedings, journals, books, and selected theses and dissertations, with the addition of a few unpublished research reports. We have not reviewed the inhouse wilderness use and user records of resource management agencies except annual use reports. Finally, our literature review is largely limited to research completed on officially designated wilderness lands managed by the U.S. Department of Agriculture, Forest Service, and U.S. Department of the Interior, National Park Service. Almost no published use and user research was found for U.S. Department of the Interior, Fish and Wildlife Service and Bureau of Land Management-managed lands, the other two Federal wilderness-managing agencies. Wilderness-related research conducted prior to 1964 when the Wilderness Act became law-most notably that in the Boundary Waters Canoe Area of Minnesota-was included, as was research on backcountry areas that later became or will likely soon become officially designated wilderness.

Our discussion of measurement methods describes the peculiarities of collecting visitor data in wilderness settings and identifies common problems that need to be addressed. Demographic characteristics of wilderness users included in our analysis are age, sex, education, occupation, income, place of residence, previous wilderness experience, group type, and club membership. Wilderness visit characteristics include amount of use, spatial distribution of use, time of use, party size, length of stay, method of travel, use of outfitter services, and visitor activities. Trend analyses and projections are reported for those few use and user variables for which sufficient longitudinal data are available.

## GENERAL EVOLUTION OF RESEARCH

### Focus

**Use and User Characteristics Research.** -Studies of wilderness use and user characteristics began in the late 1950's (Stone and Taves 1957; Taves and others 1960) and were emphasized in the 1960's (Bultena and Taves 1961; ORRRC 1962; Merriam 1963; Lucas 1964a; Merriam and others 1965; Burch 1966; Burch and Wenger 1967; Merriam and Ammons 1967; Hendee and others 1968). Active research continued to at least the mid-1970's (Jubenville 1971; Lime 1972; Murray 1974; Kennedy and Brown 1976; Stankey and others 1976; Bratton and others 1977; Nielsen and Shelby 1977; Echelberger and Moeller 1977).

In the early period, studies of use and user characteristics were a response to a perceived need to know who the users were, how many of them there were, and how they used wilderness. At the beginning of this period, there was a near vacuum of basic information about wilderness recreation, and great uncertainty about both its magnitude and characteristics.

**Use Measurement Research.**- A related topic, recreational use measurement technology, also received considerable research attention early (Lucas 1963; Wenger 1964; Wenger and Gregersen 1964; Lucas and Schweitzer 1965; Lucas and others 1971; James and Schreuder 1971, 1972; Elsner 1972; Lime and Lorence 1974; Lucas 1975; DeLand 1976; Marnell 1977; Ciali and others 1978; Gasvoda 1978; Plumley and others 1978) but less attention more recently (Kraushaar and others 1979; Leonard and others 1980; Leatherberry and Lime 1981; Lucas and Kovalicky 1981; Scotter 1981; Saunders 1982; Lucas 1983; Huppuch and Pellerin 1984; Petersen 1985).

Several of the early use measurement studies, particularly those in which James participated, sought to develop overall systems for estimating use of an entire wilderness, usually based on integrating trail registers and traffic counters. James headed a Forest Service recreation research unit in North Carolina with a national mission of developing recreation use measurement methods for all types of recreation areas and wilderness. Many other studies, and almost all of the more recent ones, had much more limited objectives dealing with components of the use measurement process, such as trail register registration rates or use counting with electronic or photographic techniques.

**Decline in Use/User Research.**- In the 1960's there seemed to be a consensus that professional wilderness management required reasonably accurate recreational use measurement, that guesses and rough approximations were not adequate to plan for fieldwork and public contact, to assess trends, or for research on impacts and visitor perceptions of crowding. However, coordinated research to provide wilderness managers with this needed technology largely ended early in the 1970's when the Forest Service's recreation use measurement research unit in North Carolina was discontinued, probably just short of development of a satisfactory cost-effective system for wilderness, for reasons that are not clear to us.

Most of the early surveys of wilderness use and users were fairly comprehensive, covering visit characteristics such as activities, method of travel, and length of stay; group characteristics such as party size and type of social group; and individual socioeconomic characteristics including residence, age, sex, education, occupation, and income. Often attitudes and preferences were also studied and sometimes experience. The surveys were rarely "mere description" or simple censuses. They usually focused on management issues in the study area, and generally analyzed differences among various types of visitors, classified on a variety of bases, such as method of travel, personal wilderness orientation, and experience.

Comprehensive wilderness visitor surveys became scarce after the middle 1970's and nearly disappeared in the 1980's. Only a few use and user studies were published after 1977 (Leonard and others 1978; Plumley and others 1978; Roggenbuck and others 1979; Lucas 1980, 1985b), and these were based on data collected earlier. A survey of residents of southwest and south-central Alaska covered much wilderness-type recreation (Clark and others 1982). There also were basic visitor surveys of river recreationists (Lime and others 1981), including some rivers in wilderness settings.

This decline in research attention has many possible causes. Probably the major cause is a feeling, right or wrong, that the topic has been adequately dealt with, and that, in a sense, the answers are known. Furthermore, tighter budgets and research cutbacks have forced more concentration of research on the highest priority problems, and we sense that most researchers have considered use and user studies to be lower priority. Topics more closely related to visitor experiences and behavior and their explanation and management have been assigned higher priority. Researchers also have increasingly recognized the strengths of experimental approaches contrasted to survey research.

We do not disagree entirely with their positions, but we believe that all the answers to important questions are not known. First, trends in use and user characteristics are almost unstudied, and without further comparable studies our knowledge of trends will remain extremely skimpy. Second, wilderness use/user research has been very uneven in its coverage of the wilderness system and its use. As figure 1 shows, studies have been concentrated in the Northern Rockies, the Pacific Northwest, and northern Minnesota. Relatively few studies have been conducted in the East and California. The Desert Southwest and the South are little studied. River runners have been studied more widely (Lime and others 1981) including most of these regions, but wilderness users have not been studied nearly as evenly. (Differences in the difficulty of sampling the more widely dispersed wilderness visitors compared to river floaters probably contribute to this contrast. Rivers typically have fewer access points, while wildernesses commonly have a great many trailheads, over 70 in both the Boundary Waters Canoe Area and the Bob Marshall Wilderness complex, for example.) This has hampered analysis of patterns of variations among regions and agencies. Finally, we think many wilderness managers still feel a need for good profiles of their users.

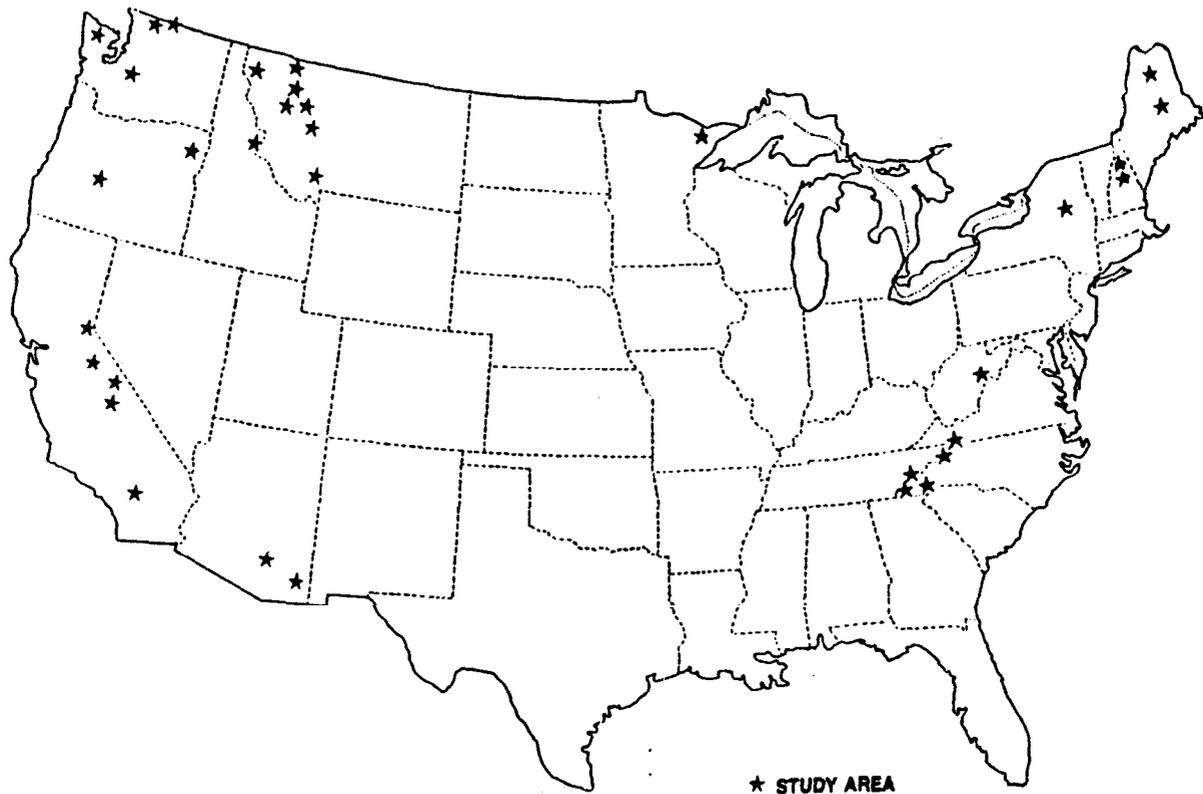


Figure 1- map of areas studied in published use and user research.

The shift in wilderness research emphasis in the 1970's away from basic descriptions of use and users and toward an understanding of the individual and social meanings and benefits of wilderness recreation resulted in part from an expanded and more comprehensive conceptualization of outdoor recreation. Prior to the 1970's, recreation was viewed primarily as participation in activities (Driver and Tocher 1970). Thus, fishing was recreation, swimming was recreation, and so on. There are many different types of fishing, for example, in highly varied settings that have little in common in terms of resources and management. Activity definitions of recreation may have hampered efforts to answer such important policy questions as "Why is the recreationist participating in the activity?" "What satisfactions or rewards are received from the activity?" and "How can the quality of the experience be enhanced?" (Driver and Tocher 1970, p. 10). To try to answer these questions, many recreation planners and researchers began to focus on the recreation experience: the sum of a participant's mental, spiritual, physiological, and other responses to a recreational engagement. Researchers expanded efforts to learn what outcomes wilderness *users* were seeking, their degree of satisfaction with the wilderness experience, perceptions of crowding within the wilderness setting, perceptions of conflict, and preferences for setting attributes that enhance wilderness experiences, stressing psychological research methods. In many of these studies, researchers also obtained information on socio-demographic characteristics of the wilderness visitors, but these data were generally collected only in an effort to better understand the dimensions of the wilder-

ness experience or with the anticipation that such basic data could help planners and managers identify and meet the needs of varying clientele.

Another emphasis in wilderness user research focuses on visitor knowledge and actual behavior. This research thrust likely has several explanations. Wilderness managers have become increasingly concerned about user impacts on the land and others' experiences. At the same time, managers have become aware of the need to foster visitor freedom as a value of wilderness. Given this, managers have increasingly turned to education in an effort to lessen impacts (Washburne and Cole 1983).

Interest in behavior stems in part from the debate among social scientists in general (Deutscher 1973) and recreation researchers in particular (Heberlein 1973) on whether people behave as their knowledge, beliefs, or attitudes would suggest. When behavior is the issue of interest, as it often is in studies of conflict, crowding, and impact in wilderness, then behavior becomes the most relevant focus. Studies of both visitor knowledge and behavior have typically included some socio-demographic variables in an effort to explain study findings. Level of experience, for example, appears to influence users' tendency to respond to suggestions for use dispersal within an area (Lime and Lucas 1977; Roggenbuck and Berrier 1982).

Finally, in recent years there has been renewed research interest in visitor impacts on soil and vegetation in wilderness. This research has often included measures of amount, time, and type of use in an effort to better understand the relationships between use and impacts (Cole 1982, 1983; Marion and Merriam 1985).

**Projections.**-- Research on wilderness recreational use projections has not been common (ORRRC 1962; Jungst and Countryman 1982; Hof and Kaiser 1983a, 1983b; Oliveira and others 1983). Unlike the basic surveys of use and users, all but one of the projection studies have been done recently. Projection research is hampered by the scarcity of recent visitor surveys to provide data on which to base projections.

**Trend Research.**-- Trend analyses of use and users also have been scarce (Lucas 1967; Cieslinski 1980; Petersen 1981; van Wagendonk 1981; Corti and others 1982; Lucas 1985a, 1985b; Burde and Curran 1986). As was true for use projections, all but one of the trend studies have been done in the last few years.

## Development of Research Methods

**Data Collection Problems.**-- Gathering data for studies of wilderness recreational use and users is difficult and costly if adequate samples are to be obtained. A number of characteristics of wilderness recreational use contribute to the difficulty.

Wilderness use is relatively light and widely dispersed. Typical wildernesses have many access points, and visitors spread out widely from the access points. Furthermore, use usually is highly variable from time to time, responding to weather, weekend leisure or weekday obligations, holidays, hunting and fishing seasons, and so on. As a result, the number of people present at any place at one time is usually low, and often there may be no one to contact or observe. Much fieldwork can produce little data, and costs are often high.

Another factor impeding efficient sampling is the lack of adequate basic use data to plan when and where to do fieldwork. Planning efficient access point sampling, for example, depends on reasonably good data on the distribution of use. The advantages of stratification or of sampling with probabilities proportional to size are reduced or lost if basic use data prove to be seriously inaccurate, as is some times the case.

Ethics sometimes limit certain kinds of data collection as well. Because of the particular character of the wilderness experience, disturbance of visitors during their experience may be undesirable. Many researchers have avoided contacting visitors within the wilderness, choosing rather to make contacts at access points before, or, more often, after the wilderness visit. Ethics also require care in use of observation techniques. Observation that might be fairly easy and unobjectionable in developed campgrounds where many people are normally present is a different matter for isolated campers in a wilderness who may believe they are the only people for miles.

Unobtrusive observation can take on some characteristics of spying, and can raise troubling questions of invasion of privacy and consent that researchers have had to face and deal with sensitively. This is an issue for both personal and photographic observation. More open, direct observation can also cause concern in some settings, particularly at campsites. Research has shown the high importance many wilderness visitors attach to campsite solitude (Stankey 1973). Researchers thinking of deliberately approaching visitors or camping near them for observational

purposes have had to consider the importance of campsite solitude to some if not most of the visitors, as well as the effect their presence may have on the behavior being observed. These concerns add to the problems of efficiently gathering data on wilderness use and users.

Several studies have coped with these problems and used observation with care. Heberlein and Dunwiddie (1979) unobtrusively observed campsite selection and party characteristics at a popular lake in the Bridger Wilderness in Wyoming. Modified movie cameras provide another type of observation. Cameras either operate in a time-lapse fashion (Marnell 1977) or are triggered to expose one or a few frames by a trail traffic counter (Leatherberry and Lime 1981; Petersen 1985). Cameras have been used on trails and rivers, which are public places where visitors are passing by, not at campsites where privacy is more critical.

Analysis of agency wilderness use data is hampered by noncomparable units of measure used by the four Federal wilderness-managing agencies-National Park Service, Fish and Wildlife Service, Bureau of Land Management, and Forest Service. This has been a problem, for example, in trend analysis (Petersen 1981) and comparison of use intensity (Hendee and others 1978, chapter 13; Washburne and Cole 1983). Long-term trend analysis is also hampered by a shift in units of measure by the Forest Service in 1965 from visits and man-days to recreational visitor-days. No conversion factors exist.

**Sampling Methods.**--Early in the 1960-to-present period, survey research was almost the only approach used in wilderness use and user studies, and it has continued to be the most common technique. Survey methods have improved substantially over the years.

Sampling techniques have improved. Early in the 1960's, the existence of a length-of-stay bias in onsite visitor sampling was recognized (Lucas 1963) and ways of avoiding or correcting for it were developed (Lucas and Schweitzer 1965). Probability samples replaced informal convenience samples that had no definable relationship to the population of interest. For example, some very early surveys depended on interviews with whomever the researcher met while traveling through the wilderness. This resulted in small samples, length-of-stay bias (the probability of a visitor being contacted was a function of the length of time he was in the area), and geographically unrepresentative samples.

Most visitor survey field techniques produce cluster samples rather than simple random samples (Lucas and Oltman 1971). For example, fieldworkers typically are stationed at a particular access point for some limited time-such as part of a day. The resulting sample is a cluster of visitors for that time and place, and probably the sample is more homogeneous than an unclustered simple random sample of the same size. Early studies failed to recognize this property. Therefore, they were not designed to be as efficient as possible and improper statistical procedures were used. This weakness has been corrected in some studies, but misuse is still common.

Sources of visitor samples became more diverse, which often resulted in better samples. Personal contacts in the field were supplemented by use permits, special trail registers, outfitter guest lists, and so on. Approaches that

did not involve direct contact in the field usually depended on mail questionnaires. This technique was used more often in later studies, even those with initial personal contact, in contrast to more use of personal interviews in earlier studies. Mail questionnaire techniques were refined and achieved very high rates of return, usually in the 80 percent range, occasionally higher. Most mail questionnaires probably imposed less on visitors at access points than the more time-consuming personal interviews because of the desire by many visitors to either start their trip or head for home.

Visitors might have more time available for interviews inside the wilderness, especially at campsites. However, not only the ethical concerns raised before but also the sampling problems discussed make this an unsatisfactory approach to most research questions (although for studies of visitor perception of onsite conditions it is an appropriate method). In this situation, the mail questionnaire worked well and avoided problems with ethics and sampling design, and therefore it became a common approach. In contrast, telephone survey techniques (Field 1973) have rarely been applied to wilderness research.

**Sampling Frames.--** The unit of analyses in visitor use and user studies has been either the visitor group (often represented by the party leader), or individual members of the group, usually above some age such as 12 or 15. Party leader-based studies were probably more common in early research. Neither unit of analysis is necessarily superior; the appropriate unit depends on the study objectives. Most wilderness visitors are in groups; typically less than 10 percent of all parties consist of one person. Much group decision making and behavior results from intragroup social dynamics. But if describing the characteristics of wilderness visitors is an objective, studying only party leaders will produce seriously misleading results (Jubenville 1971).

Most wilderness use/user studies have been based on visitors to a particular wilderness. Very few have been household surveys that include nonvisitors-including former visitors and potential visitors. One exception is Young's (1983) survey of the general public in Illinois. Again, neither is right nor wrong except in relation to study objectives (Shechter 1977).

## RESEARCH RESULTS

This section presents a comprehensive review of research on wilderness use patterns, user characteristics, use measurement strategies, trend analyses, and projections. Data typically are presented in tabular form broken down by area of study, year of study, and season of data collection. This permits analyses of differences in wilderness use and user characteristics by region of the country, season of the year, and across time. It permits the review of patterns among use and user variables, and also illustrates gaps in the data. Because the summary tables represent studies by many authors working at different times, under varying circumstances, with differing objectives, and using different data classifications, the precision of the information provided varies a great deal. For this reason, we have looked for and discussed replicated findings and gross patterns. Finally, we have often compared

wilderness user characteristics to general characteristics of the United States population. This permits identification of the segments of the general population that are receiving the benefits of wilderness and those that are under-represented.

## Use Patterns

**Amount of Use.-** Of the four Federal agencies with lands included in the National Wilderness Preservation System, only the Forest Service separates wilderness from other dispersed recreation areas in its reports of recreational use. National Forest wilderness and primitive area use was 10.2 million standard 12-hour visitor-days in 1984. Use figures become more meaningful when reported on a per-acre basis. Visitor-days of recreation use of National Forest wilderness and primitive areas was 0.31 visitor-day per acre in 1984. Additions to the wilderness system, particularly large, lightly used areas in Alaska (which averaged only 0.05 recreation visitor-day per acre in 1984) have lowered the average concentration of use for the overall system.

The National Park Service records backcountry overnight stays, many of which occur in wilderness or similar undesignated parts of Parks. In 1984, overnight backcountry stays in 47 National Parks with designated or potential wilderness totaled 0.9 million. This is probably equivalent to about 1.8 million 12-hour recreation visitor days. Day-use data are generally unavailable for National Park backcountry, in contrast to National Forest wilderness, but day-use is undoubtedly substantial for many of these four dozen parks. In Yosemite National Park, for example, visitor-days of day-use were estimated at roughly half or slightly less of the total visitordays accounted for by overnight visitors (Hendee and others 1978). If this were the case for all parks, then the wilderness and backcountry parks accounted for about 2.7 million visitor-days of wilderness recreational uses in 1984. This would average less than 0.08 visitor-day per acre, with large, lightly used Alaskan areas pulling the average down. Wrangell-St. Elias National Park includes 8.7 million acres of wilderness and reported 1,931 overnight backcountry stays in 1984, about 0.0004 12-hour visitor-days per acre. Hendee and others (1978) estimated that use of all National Park backcountry and wilderness was 3 to 5 million visitor-days in 1975, although reported use has declined since then.

**Time of Use.-** Amount of use is distributed very unevenly across seasons of the year and days of the week in virtually all wilderness areas studied. Summer is the big season of use almost everywhere, generally accounting for 60 percent or more of all use (table 1). Even in areas such as the Bob Marshall and the Great Bear Wildernesses, famous for their fall big game hunting, summer use still substantially outnumbers fall use (Lucas 1980). Also, recent studies of three western wilderness areas suggest that the concentration of use during the summer season may be increasing (Lucas 1985b).

There are, however, brief peaks of off-season use in some wilderness areas. Popular hunting areas such as the Great Bear Wilderness have heavy use during the first week or two of the hunting season. Some areas in the South, Southeast, and low elevations in the Southwest and

**Table 1.-** Time of wilderness use, weekday or weekend and season, by area

Wilderness area (State)	Year	Season	Percent of total visitors							Source
			Time of week		Season of year <sup>1</sup>					
			Weekday	Weekend <sup>2</sup>	Summer	Fall	Winter	Spring		
Bob Marshall (MT)	1970	Summer/Fall	34	66	60	40				Lucas 1990
Cabinet Mountains (MT)	1970	Summer/Fall	27	73	82	18				Lucas 1980
Great Bear (MT)	1970	Summer/Fall	24	76	55	50				Lucas 1980
Mission Mountains (MT)	1970	Summer/Fall	43	57	86	14				Lucas 1980
Scapegoat (MT)	1970	Summer/Fall	27	73	84	7				Lucas 1900
Spanish Peaks (MT)	1970	Summer/Fall	42	58	71	28				Lucas 1900
Selway-Bitterroot (MT & ID)	1971	Summer/Fall	39	61	68	32				Lucas 1990
Desolation (CA) <sup>3</sup>	1972	All year	46	54	76	20	-	4	-	Lucas 1980
Great Gulf (NH) <sup>4</sup> -day-use	1976		66	34						Leonard and others 1978
-overnight use			68	32						Leonard and others 1979
Linville Gorge (NC) <sup>5</sup>	1978	Summer/Fall	47	<sup>5</sup> 31(22)	66	34				Roggenbuck and others 1979
Shining Rock (NC) <sup>5</sup>	1978	Summer/Fall	40	<sup>5</sup> 29(31)	56	44				Roggenbuck and others 1979
Joyce Kilmer/Slickrock (NC) <sup>4</sup>	1978	Summer/Fall	44	552 (4)	57	43				Roggenbuck and others 1979
Chiricahua Mountains (Cave Creek Canyon) (AZ)	197879	All year			32	19	11	39		Shaw and Richards 1979
Great Smoky Mountains NP backcountry (NC & TN)	1979	Winter	33	77						Hammitt and Hughes 1984
	1979	Summer	52	48						Hammitt and Hughes 1954
Bob Marshall Wilderness complex (MT) <sup>6</sup>	1952	Summer/Fall	42	58	77	24				Lucas 1985b

<sup>1</sup>Season of year percentages are percentages of total use of those seasons studied.

<sup>2</sup>Unless otherwise noted, weekend use equals wilderness use that began on Friday, Saturday, or Sunday.

<sup>3</sup>Figures for Desolation Wilderness represent percentages of total user groups.

<sup>4</sup>Weekend use is use that occurs on Saturday and Sunday.

<sup>5</sup>Figure in parentheses represents percentage of total visitors whose visits covered both weekends and weekdays.

<sup>6</sup>The Bob Marshall complex indicates the Bob Marshall, Great Bear, and Scapegoat Wildernesses.

southern California have spring peaks in use. For example, the Chiricahua Mountains of southeastern Arizona receive heaviest use in the spring. In the East and Southeast, fall color attracts many visitors during October. Finally, while winter use is generally light, it is much more common than a decade ago, and is growing.

In his studies of nine western wilderness areas, Lucas (1980) found that from two-thirds to three-fourths of all visitors entered the wilderness on Fridays, Saturdays, Sundays, and during the two summer holidays (Independence Day and Labor Day) (table 2). Hendee and others (1978) reported severe weekend peaking of use on such smaller, **more** accessible wildernesses as the San Geronio and San Jacinto in California, and they hypothesized that weekend peaking was probably common in eastern wildernesses. Recent research, however, suggests that concentrations of use on weekends are not as high as expected in the East. In the Great Gulf Wilderness, three National Forest wildernesses in the Southeast, and the Great Smoky Mountains National Park in the summer, weekday use accounted for 40 to 68 percent of all use. The eastern studies have been completed more recently, and they may reflect changes in use distribution across time. Lucas.

(1985b) noted that weekend peaking of use was less pronounced in the Bob Marshall Wilderness complex in 1982 than it was in 1970. In contrast, Hammitt and Hughes (1984) noted that 1979 winter backcountry use in the Great Smoky Mountains was highly concentrated on weekends. About 77 percent of all winter use there occurred on Saturday or Sunday.

**Distribution of Use Among Areas.-** The geographical distribution of wilderness use across areas is extremely variable (table 2). Some areas are heavily used, while others are virtually untouched. Heavily used areas tend to be located near population centers, often in the Southern Appalachians, New England, Minnesota, and California. Compared to the average visitor-day use per acre of National Forest wilderness in 1984 of 0.31, use of North Carolina wildernesses averaged 5.24; Indiana, 2.36; Tennessee, 2.29; Georgia, 2.07; Minnesota, 1.16; New Hampshire, 1.07; Alabama, 0.96; California, 0.73; and West Virginia, 0.79. At the same time National Forest wildernesses in the States of Alaska and Florida averaged 0.05, and Idaho, Montana, Nevada, and Wyoming averaged less than 0.25 visitor-day/acre.

**Table 2.-** Amount and intensity of recreational use of selected National Forest wildernesses, 1984<sup>1</sup>

Area	Total recreation visitor-days	RVD's per acre
Boundary Waters Canoe Area (MN)	1,252,700	1.16
John Muir (CA)	449,900	.77
Frank Church-River of No Return (ID)	368,800	.16
Absaroka-Beartooth (MT)	332,300	.36
Indian Peaks (CO)	332,000	4.72
Alpine Lakes (WA)	287,890	.78
Weminuche (CO)	263,300	.57
Selway-Bitterroot (ID-MT)	224,400	.17
Desolation (CA)	220,000	3.47
Bridger (WY)	218,100	.51
Emigrant (CA)	216,900	1.93
San Geronio (CA)	191,700	3.38
Rockpile Mountain (MO)	900	.22
Withington (NM)	900	.05
Bristol Cliffs (VT)	800	.21
Little Wambaw Swamp (SC)	800	.16
Wambaw Swamp (SC)	700	.14
Warren Island (AK)	500	.04
Muralla Island (AK)	500	.10
Endicott River (AK)	500	.10
Coronation island (AK)	400	.02
Hell Hole Bay (SC)	100	.05
Shining Rock (NC)	123,700	6.70
Linville Gorge (NC)	72,900	6.64
Dome (NM)	29,800	5.73
Great Gulf (NH)	24,900	4.48
Never Summer (CO)	59,500	4.34
Gee Creek (TN)	9,100	3.95
Mt. Baldy (AZ)	25,700	3.63
Mokolumne (CA)	18,700	.18
Bob Marshall (MT)	148,300	.15
Bell Mountain (MO)	1,000	.11
Washakie (WY)	60,900	.09
Galiuro (AZ)	7,999	.09
Lee Metcalf (MT)	19,700	.08
Welcome Creek (MT)	1,900	.07
Kalmiopsis (OR)	12,000	.07
Hells Canyon (ID-OR)	13,100	.06
South San Juan (CO)	5,999	.05
Bradwell Bay (FL)	1,300	.05
Aldo Leopold (NM)	10,100	.05
Misty Fjords (AK)	39,500	.02
Total for all National Forest wilderness	10,209,300	0.31

<sup>1</sup>Based on the fiscal year from October 1, 1983, through September 30, 1984.

Eleven National Forest wildernesses reported over 200,000 visitor-days of use in 1984, and one, the Boundary Waters Canoe Area Wilderness (BWCAW), reported 1,252,700 visitor-days. These top 11 accounted for 41 percent of the total recreation use reported for the 165 areas designated at the beginning of 1984. Hell Hole Bay Wilderness in South Carolina had only 100 visitor-days of use, and nine other areas reported less than 1,000. Half of these lightly used areas were in the East, half in the West (most in Alaska). Low use in the eastern areas might be

explained by their recent inclusion in the National Wilderness System or lack of scenic attractions.

The estimates of visitor-day use per acre suggest equally large variation in concentration of use across areas. Six National Forest wildernesses (Linville Gorge and Shining Bock in North Carolina, Indian Peaks and Never Summer in Colorado, Dome in New Mexico, and Great Gulf in New Hampshire) had visitor-day use in excess of 4.00 per acre. At the same time, five areas (South San Juan in Colorado, Aldo Leopold in New Mexico, Hell Hole Bay in South Carolina, the North Absaroka in Wyoming, and Bradwell Bay in Florida) had 0.05 visitor-day per acre or less, as did nine National Forest wildernesses in Alaska.

Limited National Park Service data also indicate uneven distribution of use across areas. Yosemite, Sequoia, Kings Canyon, and Grand Canyon National Parks all reported close to or over 100,000 backcountry overnight stays in 1984. During the same year, several National Parks with wilderness-type lands, including Badlands, Big Thicket, Cape Krusenstern, Craters of the Moon, Death Valley, Kobuk Valley, Katmai, and Lava Beds, reported less than 1,000 overnight stays. Some reported no use.

**Intra-Wilderness Use Distribution.-** Use varies as much within as between wilderness areas. In studies of entry point use, one entry point sometimes accounts for over half of all use. Lucas (1964a) found that 52 percent of all paddling canoeists in the BWCA originated from one access point. In 1974, seven of the BWCA's 70 entry points accounted for 70 percent of all use (table 3). In 1984, use was reported for 88 entries; the top 10 accounted for 51 percent of all use. In Lucas' study of nine western areas (Lucas 1980), just three trailheads accounted for half or more of all use in every area except the Selway-Bitterroot. Generally, one-fourth of the access points had 80 percent or more of all use. In each of the nine areas, some of the trailheads were not used by any of the sampled individuals. Disproportionately high use of only a few entry points seems less pronounced in the East, but use is even more concentrated at trailheads in Yosemite National Park (table 3).

Lucas (1985b) has reported some dispersal of use to more lightly used trailheads recently in the Bob Marshall, Great Bear, and Scapegoat Wildernesses. In 1970, between 7 and 25 percent of the entry points to each of these three areas accounted for 80 percent of all use. In 1982, this amount of use entered at 33 to 45 percent of the areas' trailheads.

Use of trail segments inside wildernesses is also extremely variable. For example, while the Spanish Peaks Primitive Area had one of the most even trail use distributions among areas that Lucas (1980) studied, about 50 percent of all its visitor-miles of travel occurred on 10 percent of its trail miles. Thirty percent of its trail miles had 70 percent of all visitor use. Similarly, on some lakes in the Boundary Waters Canoe Area, contacts with other parties of canoeists are more than 40 times as numerous as on other lakes (Lime 1975). Variations in trail use concentration appear to be little related to either area size or intensity of use, but instead seem to be related to trailhead location relative to population centers, ease of road access to trailheads, location of attractions within the area, extent of trail development and trail configuration

**Table 3.-** Concentration of total wilderness use among high use entry points by area

Wilderness area (State)	Year	Season	High use entry points		Source
			Percent of total entry points	Percent of total use	
Bob Marshall (MT)	1970	Summer/Fall	25	83	Lucas 1980
Cabinet Mountains (MT)	1970	Summer/Fall	50	81	Lucas 1980
Great Bear (MT)	1970	Summer/F all	9	85	Lucas 1980
Mission Mountains (MT)	1970	Summer/Fall	25	81	Lucas 1980
Spanish Peaks (MT)	1970	Summer/Fall	38	82	Lucas 1980
Scapegoat (MT)	1970	Summer/Fall	25	85	Lucas 1980
Selway-Bitterroot (MT & ID)	1970	Summer/Fall	26	82	Lucas 1980
Desolation (CA)	1970	Summer/Fall	29	83	Lucas 1980
Boundary Waters Canoe Area (MN)	1974		10	70	Hendee and others 1978
Indian Peaks (CO)	1976	Summer	44	78	Brown and others 1977
Yosemite NP backcountry (CA)	1973	All year	4	68	van Wagtenonk 1981
	1979	All year	4	60	van Wagtenonk 1981
Maroon Bells-Snowmass (CO)	1978	Summer	23	80	Haas and others 1982
Linville Gorge (NC)	1978	Summer/Fall	21	55	Roggenbuck and others 1979
Shining Rock (NC)	1978	Summer/Fall	38	85	Roggenbuck and others 1979
Great Smoky Mountains NP backcountry (NC & TN)	1979	Winter	29	188	Hughes 1985
	1979	Summer	26	177	Hughes 1985
Bob Marshall (MT)	1962	Summer/Fall	37	79	Lucas 1985b
Great Bear (MT)	1982	Summer/Fall	33	81	Lucas 1985b
Scapegoat (MT)	1962	Summer/Fall	45	80	Lucas 1985b

<sup>1</sup>Percent of total user groups.

within the area, and distance from trailhead to the wilderness periphery.

Distribution and amount of use of campsites within wildernesses also vary a great deal, with much use concentrated at popular attractions. Large, reasonably accessible lakes are an important attraction for campers almost everywhere. In an inventory of campsites in the Spanish Peaks Primitive Area, Brown and Schomaker (1974) found that half of all campsites were within 50 feet of a lake or stream, two-thirds were within 100 feet, and 85 percent were within 200 feet. Depending on such variables as accessibility, proximity to water, and presence of a view, use of individual campsites is uneven. For example, 16 percent of the campsites in the Desolation Wilderness accounted for over half of all use: the least-used half had only 18 percent of all use (Hendee and others 1978). Many campsites in the 1982 study of the Bob Marshall Wilderness complex were estimated to receive less than 30 nights of use during the use season, but a number had over 120 nights of use (or almost constant use). Finally, Hughes (1985) reported more concentrated campsite and shelter use in the Great Smoky Mountains National Park backcountry in winter than in summer. Approximately 62 percent of winter campers used shelters, compared to 40 percent in summer. In winter, two of the park's 18 shelters accounted for 33 percent of all shelter use, and eight shelters had 73 percent of all use. In contrast, two shelters had 18 percent of all shelter use in summer, and seven had 53 percent.

**Party Size.-** Most wilderness parties (groups of individuals traveling together) are small, and appear to be getting smaller. For all areas studied, at least half of all groups were two- to four-person groups (table 4). In some

areas groups of this size accounted for 75 percent of all parties. Two-person groups are the most common. Lone individuals are scarce in wilderness, as are groups with over 10 people. For most National Forest areas studied, the percentage of one-person groups was only about 5 to 10 percent. Interestingly, lone individuals using National Park backcountry were more numerous, generally equaling between 10 and 15 percent of all user groups. Parties of more than 10 people usually numbered about 5 percent of all groups everywhere. Two notable exceptions were Montana's Scapegoat Wilderness in 1970, with 14 percent, and California's San Geronio Wilderness in 1972, with 25 percent. Average size of user groups was somewhat smaller in National Park wilderness and backcountry than in National Forest wilderness. While parties averaged four to five people on National Forests, averages were typically two to three individuals on National Park lands.

Large parties were more likely to be horse users or river rafters than hikers, and campers rather than day users, in Lucas' (1985b) study of the Bob Marshall Wilderness complex. Hunters and nonhunters had similar proportions of large parties. Finally, Lucas (1985a) suggested that group size may be getting smaller. In 1970, groups in the Great Bear and Scapegoat Wildernesses averaged 5.2 and 5.6 individuals, respectively. By 1982, these numbers had declined to 3.8 and 4.4. Many areas have placed restrictions on group size in an effort to reduce ecological and social impacts in wilderness. These limits, however, have typically been larger than most groups, so this regulation has likely had little effect on average group sizes. Users themselves, particularly the leaders of organized groups, have apparently become aware of the disproportionately high impacts of large groups, and have reduced their group sizes.

**Table 4.-** Party size of wilderness visits by area

Wilderness area (State)	Year	Season	Average size	Percent of total parties of Indicated size <sup>1</sup>				source
				1	2-4	5-10	11+	
Boundary Waters Canoe Area (MN) <sup>2</sup>	1961	Summer	5.0					Lucas 1964a
Bob Marshall (MT)	1970	Summer/Fall	4.7	6	50	42	2	Lucas 1980
	1962	Summer/Fall	4.7	6	61	25	8	Lucas 1985b
Cabinet Mountains (MT)	1970	Summer/Fall	4.0	5	69	17	4	Lucas 1980
Great Bear (MT)	1970	Summer/Fall	5.2	0	66	27	7	Lucas 1980
	1982	Summer/Fall	3.8	5	72	22	1	Lucas 1985b
Scapegoat (MT)	1970	Summer/Fall	5.6	6	60	20	14	Lucas 1980
	1962	Summer/Fall	4.4	11	60	23	6	Lucas 1985b
Mission Mountains (MT)	1970	Summer/Fall	4.5	5	56	31	5	Lucas 1980
Spanish Peaks (MT)	1970	Summer/Fall	4.8	8	56	27	6	Lucas 1980
Selway-Bitterroot (MT & ID)	1971	Summer/Fall	4.5	5	65	22	6	Lucas 1980
Desolation (CA)	1972	All year	3.8	10	66	18	4	Lucas 1980
John Muir (CA)	1972			9	72	12	7	Hendee and others 1978
San Geronio (CA)	1972			7	53	15	25	Hendee and others 1978
Yosemite NP back-country (CA)	1972			14	71	12	3	Hendee and others 1978
Sequoia-Kings Canyon NP (CA)	1972			13	75	7	5	Hendee and others 1978
North Cascades NP (WA)	1974			13	63	18	6	Hendee and others 1978
Olympic NP (WA)	1974			14	72	9	5	Hendee and others 1978
Mount Rainier (WA)	1974			13	71	14	2	Hendee and others 1978
Yosemite NP back-country (CA)	1972	All year	3.2					van Wagtendonk 1981
	1973	All year	3.1					van Wagtendonk 1981
	1974	All year	3.0					van Wagtendonk 1981
	1975	All year	3.0					van Wagtendonk 1981
	1976	All year	2.8					van Wagtendonk 1981
	1977	All year	3.0					van Wagtendonk 1981
	1978	All year	3.0					van Wagtendonk 1981
	1979	All year	2.7					van Wagtendonk 1981
Great Smoky Mountains NP backcountry (NC & TN)	1976	All year	2.8	16	73	- - 1 0 - -		Bratton arid others 1977
Great Gulf (NH)	1976	Summer	3.0	- <sup>3</sup> 50	-			Leonard and others 1978
Indian Peaks back-country (CO)	1976	Summer	2.9	11	73	- 1 6 -		Brown and others 1977
Weminuche (CO)	1977	Summer	4.4	9	64	21	7	Haas 1979
Eagles Nest (CO)	1977	<b>Summer</b>	3.6	7	74	16	5	Haas 1979
Rawah (CO)	1977	Summer	4.0	6	72	18	6	Haas 1979
White Mountains (NH)	1977-78	Winter	3.9	7	64	21	7	Taylor and Mackoy 1980
Linville Gorge (NC)	1978	Summer/Fall	4.9	- 7 3 -		19	6	Roggenbuck and others 1979
Shining Rock (NC)	1978	Summer/Fall	4.4	- 7 6 -		17	7	Roggenbuck and others 1979
Joyce Kilmer/Slickrock (NC)	1978	Summer/Fall	3.1	- 8 5 -		11	3	Roggenbuck and others 1979
Popo Agie (WY)	1978	Summer	3.1	16	69	14	1	Manfredo 1978b
Bridger (WY)	1978	Summer	3.2	16	62	21	1	Manfredo 1978b
Fitzpatrick (WY)	1978	Summer	3.6	20	58	19	3	Manfredo 1978b
Maroon Bells-Snowmass (CO)	1978	Summer	3.3					Haas and others 1982
Great Smoky Mountains NP backcountry (NC & TN)	1979	Summer	2.7	15	74	11	0	Hughes 1985
	1979	Winter	2.6	14	77	9	0	Hughes 1985
	1983	Summer	3.3		66	19	0	Burde and Curran 1986
Pusch Ridge (AZ)	1979-80	All year		-- <sup>3</sup> 74--				Purdy and Shaw 1981

<sup>1</sup>Percentages may not always add to 100 because of missing data.

<sup>2</sup>Data represent paddling canoeists.

<sup>3</sup>Figures represent percentage of one and two-person parties.

**Method of Travel.-** Hiking is the most common travel method in all wilderness areas studied except the Bob Marshall in Montana and the Boundary Waters Canoe Area in Minnesota (table 5). Typically, from 60 to 90 percent of all users of Rocky *Mountains* wildernesses are hikers. Most of the remaining users travel on horseback, and a few hike with pack and stock. In the East and in California's Desolation Wilderness, virtually all use is by hikers. Horse use in the East is extremely low where it has been reported, and most studies do not even have a horse-use category.

Exceptions to the predominance of hikers in areas are large, horse-oriented areas like the Bob Marshall, the Great Bear, and perhaps the Teton Wilderness and Idaho Primitive Area (now the Frank Church-River of No Return Wilderness) (Hendee and others 1978). But even in at least some of these areas, hiking use has grown much faster than horse use. For example, the ORRRC study (1962) estimated that 90 percent of all Bob Marshall visitors were horse users in 1959. By 1970 this number was 59 percent (Lucas 1980), and in 1982 there was an even split between the horse users and hikers (Lucas 1985b). The shift away from horse use and toward hiking use was the biggest change that Lucas (1985b) found in his comparison of 1970 and 1982 use and users of the Bob Marshall, Great Bear, and Scapegoat Wildernesses. In 1970, horse users were the clear majority in this three-area complex. By 1982, the situation had reversed, and hikers had become the most common users.

In the Lucas study (1985b) of the Bob Marshall Wilderness complex, hunters were predominantly horse users (79 percent used horses in 1970 and 69 percent in 1982). In contrast, the percentages of nonhunters using horses were 42 and 32 in 1970 and 1982, respectively. Campers were more likely than day-users to be horse users, but here, too, horse use was declining. In 1970, 61 percent of campers and 31 percent of day-users were on horseback. By 1982, these percentages had dropped to 45 percent and 15 percent. Finally, numbers of horses per horse-using party have declined from 12 in 1970 to about nine in 1982.

The Boundary Waters Canoe Area is a unique water wilderness, and there most people travel by boat or canoe. In 1984, 75 percent of all visits May through September were by paddling canoeists, 21 percent were by motor-powered canoes or motorboats, and 4 percent were by hikers.

**Outfitter Use.-** The number of wilderness visitors who use outfitter services ranges from none in many eastern and small western areas to a majority on such famed whitewater wilderness rivers as the Colorado, Middle Fork of the Salmon, and the Selway. Outfitters are common in many large, horse-oriented western wildernesses, but even in the most popular areas, visitors who employ outfitters are a distinct minority. About 35 percent of all Bob Marshall and Great Bear visitors in 1970 used outfitters (table 6). For all other areas studied, percentage of visitors employing outfitters was less than 8, and in most areas the percentage was less than 1. In the Bob Marshall, close to half the people using horses did not use outfitters (Lucas 1985b). In contrast, only 15 to 20 percent of the horse users in the Great Bear traveled without outfitters.

Outfitting is often associated with hunting and is therefore much more common in the fall. For example, Lucas

(1985b) found that 41 percent of the hunters in the Bob Marshall Wilderness complex (an area comprised of the Bob Marshall, Great Bear, and Scapegoat Wildernesses) employed outfitters in 1970; only 20 percent of the nonhunters did. About 29 percent of the Bob Marshall visitors in the summer season used outfitters; this percentage increased to 47 in the fall. Similarly, just 4 percent of the summer Selway-Bitterroot users employed outfitters, but this figure reached 23 percent in the fall.

While outfitting is a sizable industry on many rivers and in large western wildernesses, the percentage of wilderness users employing outfitters appears to be declining. As one example, Lucas (1985b) found that 31 percent of the visitors to the Bob Marshall Wilderness complex used outfitters in 1970, but this percentage decreased to 17 in his 1982 study. A drop occurred in both the summer and fall seasons (table 6).

**Length of Stay.-** Wilderness visits are typically short. For many small- to medium-sized wildernesses, 1-day visits predominate (Hendee and others 1978). Even in several large western wilderness areas, day visits are the majority. For example, Lucas (1980) found that more than 60 percent of all visits to the Cabinet Mountains and Mission *Mountains* Wildernesses and the Spanish Peaks Primitive Area of Montana were 1-day visits. Even in the very large Selway-Bitterroot Wilderness in Idaho and Montana, 48 percent of all visits were for a day or less (table 5). At the same time, long trips (trips of a week or more) were rare, accounting for less than 10 percent of visits to all areas except the Bob Marshall and the Great Bear. Half of the western areas studied had no sampled trips longer than 1 week. Average length of stay was typically 2 to 3 days across areas in all regions of the country. Exceptions were the Boundary Waters Canoe Area; Bob Marshall, Great Bear, and Great Smoky Mountains summer users, where lengths of stay averaged from 4 to 5 days. Users of the Popo Agie, Bridger, and Fitzpatrick Wildernesses in Wyoming also had longer stays, perhaps partly due to very long trips by classes from the National Outdoor Leadership School located nearby.

Lucas (1980, 1985b) reported that certain kinds of users have more lengthy stays. Among nine areas that he studied in 1970, horse users averaged a 3.8-day length of stay; this average was 2.2 for hikers. The difference was even greater for the Bob Marshall Wilderness complex, where horse users in 1970 stayed an average of 7.4 days, but hikers stayed for only 2.9 days. Much of the difference between horse users' and hikers' length of stay appears due to differential proportions of day-users. About 32 percent of all hikers were day-users; only 8 percent of the horse travelers stayed such a short time. Hunters and nonhunters had similar lengths of stay in 1970, but by 1982, hunters in the Bob Marshall complex were staying longer than nonhunters (6.7 compared to 4.3 days).

While Hendee and others (1978) suggested that increased travel costs would likely cause wilderness use to shift to fewer but longer trips, recent research suggests that wilderness trips are getting shorter. Lucas (1985b) found visits to the Bob Marshall Wilderness complex to average 5.7 days in 1970; by 1982, trip length had decreased to 4.7 days. Length of stay for horse users dropped from 7.4 days in 1970 to 6.7 days in 1982. The gradual decline in average length of stay in wilderness

Table 5.—Method of travel and length of stay for wilderness visitors by area

Wilderness area (State)	Year	Season	Percent of total visits by travel method					Avg. stay	Percent of total visits of each length (days)				Source
			Hike	Horse	Hike with stock		Other		1	2-3	4+		
					Hike	Horse							
Boundary Waters Canoe Area (MN)	1981	Summer						5.1					Lucas 1984a
Bob Marshall (MT)	1964	Summer/Fall						8					Merriam and Ammons 1967
Mission Mountains (MT)	1964	Summer/Fall						2					Merriam and Ammons 1967
Glacier NP backcountry (MT)	1964	Summer/Fall						4					Merriam and Ammons 1967
Eagle Cap (OR)	1965	Summer						3.0					Hendee and others 1968
Three Sisters (OR)	1965	Summer	85	15	0	0	0	2.2					Hendee and others 1968
Glacier Peak (WA)	1965	Summer	82	18	0	0	0	2.2					Hendee and others 1968
Bob Marshall (MT)	1970	Summer	31	59	6	4	4	5.7	14	23	56		Lucas 1980
Bob Marshall Wilderness complex (MT)	1982	Summer/Fall	57	36	6	4	4	4.7	22	24	54		Lucas 1985b
Cabinet Mountains (MT)	1970	Summer/Fall	90	7	2	1	1	1.6	67	25	7		Lucas 1980
Great Bear (MT)	1970	Summer/Fall	46	42	0	15	0	4.9	25	13	63		Lucas 1980
Mission Mountains (MT)	1970	Summer/Fall	97	2	0	1	0	1.7	62	28	10		Lucas 1980
Spanish Peaks (MT)	1970	Summer/Fall	72	20	7	1	0	1.9	63	22	12		Lucas 1980
Selway-Blitterroot (MT & ID)	1971	Summer/Fall	70	20	6	5	5	2.9	48	25	29		Lucas 1980
Desolation (CA)	1972	All year	99	0	1	0	0	3.3	17	42	40		Lucas 1980
Scapegoat (MT)	1970	Summer/Fall	64	18	12	1	1	2.9	41	37	22		Lucas 1980
Appalachian Trail (Southern NF's)	1970-71	Summer/Fall							78	13	9		Murray 1974
—low experience									46	37	17		Murray 1974
—moderate experience									35	23	42		Murray 1974
—high experience													van Wagtendonk 1981
Yosemite NP backcountry (CA)	1972	All year						2.9					van Wagtendonk 1981
	1973	All year						3.0					van Wagtendonk 1981
	1974	All year						2.7					van Wagtendonk 1981
	1975	All year						2.8					van Wagtendonk 1981
	1976	All year						2.6					van Wagtendonk 1981
	1977	All year						2.6					van Wagtendonk 1981
	1978	All year						2.4					van Wagtendonk 1981
	1979	All year						2.8					van Wagtendonk 1981
Boundary Waters Canoe Area (MN)	1974	All year	3	N/A	N/A	197		2.8					Hendee and others 1978
	1984	May-Sept.	4	N/A	N/A	96							Superior NF 1984
	1976	All year						2.5	64	36			Bratton and others 1977
Great Smoky Mountains NP backcountry (NC & TN)	1977	Summer						3.4	16	25	59		Brown and Haas 1978
Weminuche (CO)	1977	Summer						1.4	36	48	16		Brown and Haas 1978
Eagles Nest (CO)	1977	Summer						2.3	12	53	34		Brown and Haas 1978
Rawah (CO)	1977-78	Winter							60	—	41		Taylor and Mackoy 1980
White Mountains (NH)	1978	Summer/Fall						2.7	37	52	12		Roggenbuck and others 1979
Linville Gorge (NC)	1978	Summer/Fall						2.8	29	54	18		Roggenbuck and others 1979
Shining Rock (NC)	1978	Summer/Fall						2.9	24	52	24		Roggenbuck and others 1979
Joyce Kilmer/Slickrock (NC)	1978	Summer/Fall							80	80			Gilbert 1980
Yosemite NP backcountry (CA)	1978	Winter							7	38	55		Manfredo 1978b
Popo Agle (WY)	1978	Summer							11	31	59		Manfredo 1978b
Bridger (WY)	1978	Summer							12	16	72		Manfredo 1978b
Fitzpatrick (WY)	1978	Summer							38	43	19		Haas and others 1982
Maroon Bells-Snowmass (CO)	1978	Summer							37	41	22		Reiling and others 1981
Baxter State Park (ME)	1979	Summer	97	3	0	0	0	2.7					Hughes 1985
Great Smoky Mountains NP backcountry (NC & TN)	1979	Summer	100	0	0	0	0	3.0					Hughes 1985
Pusch Ridge (AZ)	1979	Winter						2.1	74	26			
	1980	All year							78	18	33		Purdy and Shaw 1981
Great Smoky Mountains NP backcountry (NC & TN)	1983	Summer						4.5	50	33	50		Burde and Curran 1986

<sup>a</sup>57 percent paddle canoe, 10 percent motor canoe, 28 percent motorboat, 3 percent snowmobile (Lime and Buchman 1975).  
<sup>b</sup>75 percent paddle canoe, 21 percent motor canoe or boat.

**Table 6.-** Percent of total wilderness visits that employ outfitters

Wilderness area (State)	Year	Season	Visits that use outfitters			Source
			Total	Summer	Fall	
Bob Marshall (MT)	1970	Summer/Fall	35	29	47	Lucas 1980
Great Bear (MT)	1970	Summer/Fall	35			Lucas 1980
Cabinet Mountains (MT)	1970	Summer/Fall	<1			Lucas 1980
Mission Mountains (MT)	1970	Summer/Fall	<1			Lucas 1980
Scapegoat (MT)	1970	Summer/Fall	<8			Lucas 1980
Spanish Peaks (MT)	1970	Summer/Fall	<8			Lucas 1980
Bob Marshall Wilderness	1970	Summer/Fall	31	21	46	Lucas 1985b
complex (MT)	1982	Summer/Fall	17	14	24	Lucas 1985b
Selway-Bitterroot (MT & ID)	1971	Summer/Fall	<8	4	23	Lucas 1980
Desolation (CA)	1972	All year	<1			Lucas 1980

seems due to the presence of proportionately more hikers, fewer horse users, and fewer hunters.

**Wilderness Activities.--** Recreationists typically participate in a variety of activities during a wilderness trip. For example, Lucas (1980) found that users of nine western wilderness areas averaged 2.5 to 3.1 activities during their visits. Hiking, fishing (where it is possible), and photography were the most common activities (table 7). At least three-fourths of all visitors to virtually all areas hiked. More than half of all visitors fished or took pictures. Hendee and others (1977), however, reported that fishing was often incidental to other activities in wilderness, and was only engaged in for limited times during the trip. Nature study (such as birdwatching, wildlife observation, plant identification, amateur geology) is generally the most common activity after photography. Swimming is common in many places, particularly in areas in the Southeast and California (table 7). Mountain climbing is rare except for a few areas. Hunting in National Forest wildernesses ranges from almost none to fairly common, but is generally less common than might be expected of all areas studied, only in the Bob Marshall and the Great Bear did more than 20 percent of the sampled visitors hunt. Even in the fall hunting season, many visitors were not hunters. For example, Lucas (1980) reported that 30 percent of the Selway-Bitterroot users and 80 percent of the Mission Mountains visitors were not hunting during this period.

Activity participation also varies by season of year and type of user (Lucas 1980). Almost all hunting, of course, occurs in the fall; most other activities predominate in the summer. Summer visitors engage in more activities per trip than fall users. Hikers are much more likely to study nature or swim than horse users, but horse travelers tend to hunt and take pictures. Fishing is common among both user groups. Campers engage in a greater variety of activities per visit than day-users, but nature study and hunting are common among single-day visitors.

Lucas (1985b) recently studied activity participation for the Bob Marshall, Great Bear, and Scapegoat Wildernesses and found little change in number and kind of visitor activities between 1970 and 1982. Hiking, fishing, and photography remained important. Of these, only fishing declined, and only slightly. Hunting was the only activity with a substantial change, and it dropped in importance (table 7). These data suggest that there may be a slight shift away from the more consumptive uses of wilderness toward more contemplative activities.

## Variation in Use Patterns

While use patterns show considerable similarities across areas, differences do exist. These variations appear to be explained in large measure by some combination of the following 12 variables: region, proximity to population centers, area size, character of the resource, presence of attractions, managing agency, time of establishment as wilderness, extent of area access, time (season and year), trail system configuration, type of user, and tradition.

**Region--** Several authors have examined differences in wilderness use patterns by region of the country, and fewer differences have been found than were initially expected (Roggenbuck 1980; Timm 1980; Boteler 1981). Regions of the country with high population concentrations tend to have wildernesses with high use. New England, the Southeast, the Midwest, and California are examples. But each of these regions has some wildernesses with very low use. Time of wilderness use is also significantly influenced by regional location. Early spring or fall color use reduces the typical peaking of summer use in some areas in southern Arizona, southern California, and the Southeast. Weekend peaking appears less severe in the East, at least in summer. Apparently more visitors there use wilderness while on their annual vacation. Horse use and therefore outfitting use are almost nonexistent in eastern wilderness.

**Proximity to Population Centers.--** Proximity to population centers seems to be an even better predictor of total amount of use than regional location. Also, relationship of the wilderness to nearby urban centers strongly influences distribution of visitor use among the area's trailheads and trail segments. Those entry points and trails closest to population concentrations receive the most use. Weekend peaking of use is much more severe among areas located near population centers, at least in the West.

**Area Size.--** Size of wilderness has considerable influence on type and distribution of use among trail segments. Extremely large areas are much more likely to have a higher proportion of horse use. Outfitting tends to be more common in large areas. Trail segments deep inside vast areas typically have less use than those in the heart of smaller areas.

**Character of the Resource.--** The character of the wilderness resource—its ecosystem characteristics—

**Table 7.** -Wilderness activities participated in by area

Wilderness area (State)	Year	Season	Percent of total visits involving the activity										Source
			Fish	Hunt	Hike	Photog- raphy	Nature study	Mountain climbing	Swim	Cross- country skiing	Snow shoe- ing	Other <sup>1</sup>	
Bob Marshall (MT)	1970	Summer/Fall	61	34	56	56	26	0	11			16	Lucas 1980
Cabinet Mountains (MT)	1970	Summer/Fall	61	6	61	45	25	2	15			19	Lucas 1980
Great Bear (MT)	1970	Summer/Fall	62	43	54	53	15	0	4			16	Lucas 1960
Mission Mountains (MT)	1970	Summer/Fall	74	2	79	56	31	2	16			6	Lucas 1960
Spanish Peaks (MT)	1970	Summer/Fall	41	16	70	53	29	4	9			7	Lucas 1960
Scapegoat (MT)	1970	Summer/Fall	62	11	74	53	27	2	20			14	Lucas 1980
Selway-Bitterroot (MT & ID)	1971	Summer/Fall	43	16	75	56	35	2	17			7	Lucas 1960
Desolation (CA)	1972	All year	46	1	94	54	52	4	46			11	Lucas 1960
Adirondack High Peaks (NY) <sup>2</sup>	1974-75	Winter			25			32		36	19		Snowden 1976
Weminuche (CO)	1977	Summer	52		92	73	42	8					Brown and Haas 1978
Eagles Nest (CO)	1977	Summer	46		94	65	31	4					Brown and Haas 1976
Rawah (CO)	1977	Summer	54		94	73	7	3					Brown and Haas 1978
White Mountains (NH)	1977-76	Winter			45			8		50	26		Taylor and Mackoy 1980
Linville Gorge (NC)	1976	Summer/Fall	15	3	<sup>3</sup> 89 <sup>4</sup> 48	48	41	26	39				Roggenbuck and others 1979
Shining Rock (NC)	1976	Summer/Fall	5	5	<sup>3</sup> 87 <sup>4</sup> 42	48	43	3	25				Roggenbuck and others 1979
Joyce Kilmer/Slickrock (NC)	1976	Summer/Fall	12	6	<sup>3</sup> 91 <sup>4</sup> 35	46	47	3	35				Roggenbuck and others 1979
Yosemite NP back-country (CA)	1978	Winter								92			Gilbert 1980
Baxter State Park (ME)	1979	Summer	23		566 <sup>5</sup> 51	68	<sup>7</sup> 34 <sup>6</sup> 67	1				15	Reiling and others 1981
Bob Marshall Wilderness complex (MT)	1982	Summer/Fall	57	16	66	61	26	1	17			15	<b>Lucas 1985b</b>

<sup>1</sup>Other includes such activities as horseback riding, river ratting, and camping.

<sup>2</sup>Day trips only.

<sup>3</sup>Hiking on trails.

<sup>4</sup>Hiking off trails.

<sup>5</sup>Mountain hiking.

<sup>6</sup>Gentle terrain hiking.

<sup>7</sup>Birdwatching.

<sup>8</sup>Other wildlife observation.

strongly influences the amount, nature, and distribution of use. Some swamp and lowland wildernesses in the Southeast receive almost no use. (Bradwell Bay in Florida is an example.) Water areas like the Boundary Waters Canoe Area Wilderness and several wildernesses with whitewater rivers have extremely high canoe or boat use and relatively little horse or hiking use. Outfitting is common in these lake and river wildernesses. While off-trail use is low everywhere, it is much higher in alpine areas with trail systems that take visitors above timberline. Finally, the nature of the resource largely explains the extent of such wilderness activities as hunting, fishing, rock climbing, and swimming.

**Presence of Attractions.-** The presence of attractions such as lakes, mountain peaks, views, and rock climbing

opportunities within a wilderness affects the total number of visitors, where visitors go, and what they do. Some wilderness areas in the East and Midwest, regions of high population concentrations, have low use. While reasons for lack of visitation are largely unknown, their lack of special attractions is a likely cause. These areas have apparent naturalness, but they may be “ordinary woods” in the minds of potential visitors. The concentration of travel and camping use around lakes, rivers, views, and ridgelines is common throughout wilderness. This is especially the case in small areas with only a single or a few attractions.

**Managing Agency.-** Research suggests limited differences in patterns of National Forest and National Park wilderness visitors. National Park visitors are more likely to be alone, to travel in small parties, and they do not

hunt (with limited exceptions in Alaska). There are almost certainly fewer horse users in the parks, but we found no data to substantiate this.

**Time of Establishment as Wilderness-** The relatively low use of many recently established wilderness areas in the East, Midwest, and West may be due to their lower scenic quality or the presence of fewer attractions, but it may also be that the new areas have not yet become widely known. Several of these areas were designated “wilderness” not so much because of their current recreational popularity, but because of their apparent naturalness, opportunities for solitude, and their potential for providing a more complete ecosystem representation within the Wilderness System.

**Extent of Area Access-** Type and degree of access to the wilderness influence amount, nature, and distribution of area use. Most island wildernesses have little or no use, either because there is no public access or because access is strictly controlled. Some wildernesses—the Great Bear and the Frank Church-River of No Return Wildernesses—have airfields within or adjacent to them, and this affects their kind of use and users. Perhaps most important, the kind of access to individual trailheads strongly influences the amount of use that the entry points and their trails receive. Entry points reached only after travel for long distances on dusty, gravel roads filled with “chuck holes” tend to receive less use than those reached over short, good roads.

**Time (Season and Year)-** As might be expected, season of the year substantially affects amount of use. For virtually all wilderness areas, summer is the season of highest use. But season of use also influences what people do in wilderness, method of travel, weekly pattern of use, and length of stay. Hunting is a fall activity almost everywhere. Because of the large number of hunters, fall has the highest proportion of horse users. Length of stay tends to be somewhat longer in fall but shorter in winter. Winter activities include cross-country skiing and snowshoeing, and peaking of weekend use seems even more severe in winter than in other seasons.

**Trail System Configuration-** Since virtually all wilderness users stick to established trails, the trail system has a strong influence on where people travel and where they camp. Some wildernesses have a single trail that leads from an entry point to an area attraction, with few branching alternative routes. Such trails tend to become heavily used, two-way traffic corridors. Other areas have multiple trails that converge at a single Point. Such points, especially at attractions, tend to become popular for eating, resting, and camping:

**Type of User-** The type of user—hiker or horse user, day-user or camper, hunter or nonhunter—is significantly related to wilderness use patterns. Horse users come in larger groups, stay longer, and penetrate deeper into the wilderness than hikers do. Horse travelers also are more likely to hunt and take photos, while hikers are more likely to engage in swimming and nature study. Hunters are predominantly horse users, and are more likely to be outfitted, come in the fall, and stay longer. Campers are more likely than day-users to be horse users, travel in larger groups, and engage in more activities. River rafters tended to visit the wilderness in large groups and be outfitted.

**Tradition-** Finally, while no hard data are available to substantiate the idea, some wilderness areas seem to have certain users because they traditionally have had those uses. The Bob Marshall has the image of a horse area; the Boundary Waters Canoe Area is perceived as a canoe area. Perhaps because of past use histories or images in the minds of potential users, these areas continue to attract traditional user groups.

## User Characteristics

**Age-** Wilderness users tend to be young, younger than the general population. Table 8 indicates that there is a substantial overrepresentation of 16- to 25-year-olds and 26- to 35-year-olds among wilderness visitors compared to the general population in virtually all wilderness areas studied. However, the 36-45 age group is also overrepresented in most areas, and the 46-55 age category is common in wilderness, being present in proportions similar to their numbers in the general population. When wilderness allocation decisions are debated, opponents often argue that wilderness designation denies access to the old and the young (Lucas 1980). Table 8 suggests that the 56 and older age groups are substantially underrepresented, but older people have lower participation rates in all types of outdoor recreation (Bureau of Outdoor Recreation 1972). Older people do visit wilderness. For example, 10, 11, and 12 percent of the 1970 wilderness visitors in the Bob Marshall, Selway-Bitterroot, and Great Bear Wildernesses, respectively, were 56 years or older. While table 8 suggests that young children are substantially underrepresented in most wildernesses, this is in part an artifact of data collection methods. Typically, the referenced surveys did not include children under about 16 years of age. Lucas (1980) reported that about half of all wilderness user groups in the nine areas he studied contained children.

The few studies done in the East and Southeast suggest age distributions similar to those in the Rockies and the Pacific Northwest. If anything, users in the East are slightly younger. Lucas (1980) reported little association between season of visit and age of visitor, but his data generally reflect studies of only ‘summer and fall users. While data are almost nonexistent, research in the Great Smoky Mountains National Park backcountry and in the White Mountains of New Hampshire suggests that winter users are younger. Finally, Lucas (1980) found that horse users were somewhat older than hikers and campers were somewhat younger than day-users in the nine western areas he studied.

**Gender-** Table 8 indicates most wilderness visitors are males; percentages typically range from 70 to 85 percent. In smaller, hiking-oriented areas, the number of males is often at the lower end of this range; but in the larger, horse-oriented areas, percentages are at the upper end (Hendee and others 1978). Lucas (1980) indicated that for the fall season, particularly in popular hunting wildernesses, the percentages of males are even higher. The limited data on winter wilderness visitors are mixed. Hughes (1985) surveyed almost no women in the backcountry of Great Smoky Mountains National Park during her winter use study, but Snowden (1976) and Taylor and Mackoy (1980) found the proportion of winter female

**Table 8.-** Age and gender of wilderness visitors<sup>1</sup>

Wilderness area (State)	Year	Season	Age (percent of total)										Percent male	Source		
			1-15	16-25	26-35	36-45	46-55	56-64	65+							
Boundary Waters Canoe Area (MN) <sup>2</sup>	1960	Summer	30	42	13	-	1	3	-	-	2	-	8	2	Lucas 1964	
Glacier Peak (WA), Eagle Cap (OR), and Three Sisters (OR)	1965	Summer	3	21	24	23	21	5	2				82		Hendee and others 1968	
Bob Marshall (MT)	1970	Summer/Fall	13	17	21	25	13	-	1	0	-		80		Lucas 1980	
Cabinet Mountains (MT)	1970	Summer/Fall	8	40	22	12	12	-	6	-			70-80		Hendee and others 1978	
Great Bear (MT)	1970	Summer/Fall	0	7	30	32	18	-	1	2	-		87		Lucas 1980	
Mission Mountains (MT)	1970	Summer/Fall	9	24	25	20	14	-	9	-			70-80		Hendee and others 1976	
Spanish Peaks (MT)	1970	Summer/Fall	26	29	17	17	9	-	3	-			70-80		Hendee and others 1978	
Scapegoat (MT)	1970	Summer/Fall	4	29	25	24	11	-	8	-			70-80		Hendee and others 1978	
Appalachian-Trail (Southern NF's)	1970-71	Summer/Fall	0	50	20	15	9	-	6	-			70		Murray 1974	
Selway-Bitterroot (ID & MT)	1971	Summer/Fall	4	27	24	19	14	-	1	1	-		70-80		Hendee and others 1978	
Desolation (CA)	1972	All year	29	28	18	12	10	-	2	-			-		Hendee and others 1978	
Great Smoky Mountains NP backcountry (NC & TN)	1973	Summer	0	34	31	19	-	1	6	-			92		Burde and Curran 1986	
Adirondack High Peaks (NY)	1960	Summer											83		Snowden 1976	
	1974-75	Winter											78		Snowden 1976	
Eagles Nest (CO)	1977	Summer		<b>62</b>				<b>37</b>					1		78	Brown and Haas 1978
Rawah (CO)	1977	Summer		<b>76</b>				<b>22</b>					1		79	Brown and Haas 1978
Weminuche (CO)	1977	Summer		<b>61</b>				<b>37</b>					1		80	Brown and Haas 1978
Popo Agie (WY)	1978	Summer	<b>7</b>		<b>78</b>			<b>14</b>					<b>1</b>		75	Manfredo 1978b
Bridger (WY)	1976	Summer	<b>17</b>		<b>71</b>			<b>10</b>					<b>3</b>		72	Manfredo 1978b
Fitzpatrick (WY)	1978	Summer	<b>1</b>		<b>74</b>			<b>20</b>					<b>5</b>		72	Manfredo 1978b
Linville Gorge (NC)	1978	Summer/Fall	<b>11</b>	<b>31</b>	<b>37</b>	<b>13</b>				<b>7</b>					73	Roggenbuck and others 1979
Shining Rock (NC)	1978	Summer/Fall	12	27	32	16				<b>13</b>					75	Roggenbuck and others 1979
Joyce Kilmer/Slickrock (NC & TN)	1978	Summer/Fall	10	34	36	12				<b>8</b>					69	Roggenbuck and others 1979
White Mountains (NH)	1977-78	Winter	0	32	37	19	8			<b>4</b>					74	Taylor and Mackoy 1980
	?	Summer	0	37	29	17	10			<b>6</b>					64	Taylor and Mackoy 1980
Great Smoky Mountains NP backcountry (NC & TN)	1979	Winter	0	38	45	10	<b>6</b>			<b>2</b>		<b>0</b>			99	Hughes 1985
Baxter State Park (ME)	1979	Summer	22	30	25	10	<b>6</b>			<b>7</b>			?			Reiling and others 1981
Bob Marshall (MT)	1982	Summer/Fall	13	18	24	23				<b>22</b>					70	Lucas 1985b
Great Smoky Mountains NP backcountry (NC & TN)	1983	Summer	0	34	38	15	<b>9</b>			<b>4</b>					89	Burde and Curran 1986
U.S. population	1960		33	13	13	12	<b>12</b>			<b>8</b>		<b>9</b>				U.S. Census
	1970		31	17	12	11	<b>11</b>			<b>18</b>						U.S. Census
	1978		25	19	15	11	<b>10</b>			<b>20</b>						Reiling and others 1981

<sup>1</sup>Age data on wilderness visitors and U.S. population were interpolated to fit table's age categories.

<sup>2</sup>Data are for paddle canoeists.

**Table 9.-** Education level distribution as a percent of total wilderness visitors by area

Wilderness area (State)	Year	Season	Years of schooling completed							Source
			0-8	9-11	12	13-15	16	17+		
Boundary Waters Canoe Area (MN) <sup>1</sup>	1960	Summer	0	- 2 1	-	- 5 4	-	2 5	Lucas 1964a	
Glacier Peak (WA)	1965		-	3 5	-	- 3 6	-	2 9	Hendee and others 1968	
Eagle Cap (OR)	1965		-	3 8	-	- 3 8	-	2 4	Hendee and others 1968	
Three Sisters (OR)	1965		-	3 6	-	- 3 4	-	3 0	Hendee and others 1968	
High Sierra (CA)	1960		-	1 8	-	- 4 9	-	3 3	Hendee and others 1968	
Bob Marshall (MT)	1970	Summer/Fall	4	14	22	17	11	31	Lucas 1980	
Cabinet Mountains (MT)	1970	Summer/Fall	3	22	26	24	8	15	Lucas 1980	
Great Bear (MT)	1970	Summer/Fall	3	6	29	15	24	24	Lucas 1980	
Mission Mountains (MT)	1970	Summer/Fall	4	14	15	16	12	35	Lucas 1980	
Spanish Peaks (MT)	1970	Summer/Fall	2	10	21	26	8	30	Lucas 1980	
Scapegoat (MT)	1970	Summer/Fall	4	13	30	24	9	18	Lucas 1980	
Appalachian Trail (Southern NF's)	1970-71	Summer/Fall	-	2 0	-	- 4 4	-	3 8	Murray 1974	
Selway-Bitterroot (MT & ID)	1971	Summer/Fall	3	10	27	23	9	27	Lucas 1980	
Desolation (CA)	1972	All year	0	5	12	29	11	42	Lucas 1980	
Cranberry back- country (WV)	1972	Spring/ Summer/Fall	- 2 2	- 4 1		15	- 2 2	-	Echelberger and Moeller 1977	
Adirondack High Peaks (NY)	1960 1974-75	Summer Winter	-	1 6 1 9	-	- 5 7 - 5 3	-	2 2 2 8	Snowden 1976	
Weminuche (CO)	1977	Summer	1	8	14	24	18	39	Brown and Haas 1978	
Rawah (CO)	1977	Summer	0	6	11	24	25	34	Brown and Haas 1978	
Eagles Nest (CO)	1977	Summer	0	2	10	27	26	33	Brown and Haas 1978	
Yosemite NP backcountry (CA)	1978	Winter				-	9 2	-	Gilbert 1980	
Linville Gorge (NC)	1978	Summer/Fall	- 1	- 1 5		27	20	37	Roggenbuck and others 1979	
Shining Rock (NC)	1978	Summer/Fall	- 3	- 1 9		26	21	31	Roggenbuck and others 1979	
Joyce Kilmer/Slickrock (NC)	1978	Summer/Fall	- 0	- 1 4		25	19	41	Roggenbuck and others 1979	
Baxter State Park (ME) <sup>2</sup>	1979	Summer	- 2	- 1 5		18	22	43	Reiling and others 1981	
Bob Marshall Complex (MT)	1982	Summer/Fall	2	7	22	23	21	26	Lucas 1985b	
U.S. population	1960		-	92 -		-	8	-	Hendee and others 1968	
	1970		28	17	34	1 0	- 1 1	-	U.S. Census	
	1980		17	14	37	1 5	- 1 7	-	U.S. Census	

<sup>1</sup>Data represent Peddling canoeists.  
<sup>2</sup>Education level of head of household.

visitors in their eastern study areas to be similar to proportions in other seasons of the year. The 20 to 25 percent women found in most studies do, however, represent a significant minority in wilderness. Numbers of women may be increasing. For example, Lucas (1985b) reports that the proportion of female visitors to the Bob Marshall Wilderness grew from 20 percent in 1970 to 30 percent in 1982.

**Education.-** The most distinguishing characteristic of wilderness users is their high education level. As table 9 indicates, at least 25 percent of the visitors to most areas studied either are attending or have attended graduate school. In most areas, about 40 percent have completed college; in some areas this number exceeds 50 percent. This far exceeds the schooling for the United States general population, where 11 and 18 percent completed college or attended graduate school in 1970 and 1980, respectively. In most areas the proportion of wilderness visitors going to school beyond college is greater than the proportion of the U.S. population that goes beyond high school (Lucas 1980). Also, the difference between wilder-

ness visitors and the general population is even larger than these figures suggest, for the U.S. census data are based on education levels of people 25 or more years of age. Wilderness surveys generally include individuals down to 16 years old. Many of these are students and have not yet completed their schooling, so their education attainment usually is lower than it would be at 25.

Education levels vary a great deal among study areas, but all are much higher than both the national average and the average for their State. Variation across areas seems due in part to the time of the study (with the higher educational levels of areas studied most recently reflecting the growing educational levels in the country), the overall education levels of the area's State (thus the large number of visitors to Desolation Wilderness, CA, with graduate education), and the educational levels of nearby communities. Montana areas with adjacent small forest industry towns have visitors with lower educational levels than wildernesses near university towns (Lucas 1980). Educational levels also vary with other wilderness

**Table 10.-** Occupational distribution as a percent of total wilderness visitors by area

Wilderness area (State)	Year	Occupation									Other	source
		Profes- sional and technical	Business manager	Craftsman and operations	Farmer	Clerical, sales, and service worker	Military	House- wife	Student			
Boundary Waters Canoe Area (MN) <sup>1</sup>	1960	71	13	2	1	7					6	Lucas 1964a
Bob Marshall (MT)	1964	18	28	3		15	9		27			Merriam and Ammons 1967
Mission Mountains (MT)	1964	49	7	4		16			22	2		Merriam and Ammons 1967
Glacier NP back- country (MT)	1964	39	16			13			32			Merriam and Ammons 1967
Bob Marshall (MT)	1970	32	11	15	3	9	2	9	17	2		Lucas 1900
Cabinet Mountains (MT)	1970	20	2	16	2	7	2	9	31	11		Lucas 1980
Great Bear (MT)	1970	33	5	14	5	11	1	9	4	6		Lucas 1980
Mission Mountains (MT)	1970	41	2	15	2	5	0	9	20	5		Lucas 1980
Spanish Peaks (MT)	1970	31	5	10	5	8	1	7	34	2		Lucas 1980
Scapegoat (MT)	1970	23	6	10	6	9	7	9	26	4		Lucas 1980
Appalachian Trail (Southern NF's)	1970-71	60	17		6			12		5		Murray 1974
Selway-Bitterroot (MT & ID)	1971	26	4	14	5	10	0	9	<b>22</b>	10		Lucas 1980
Desolation (CA)	1972	39	1	7	0	11	3	1	<b>30</b>	6		Lucas 1980
Linville Gorge (NC)	1978	47	14	5	0	11		1	<b>17</b>	5		Roggenbuck and others 1979
Shining Rock (NC)	1978	29	29	9	1	12		2	<b>10</b>	8		Roggenbuck and others 1979
Joyce Kilmer/ Slickrock (NC)	1978	42	13	8	1	14		3	<b>14</b>	5		Roggenbuck and others 1979
Cranberry back- country (WV)	1972	-	-	3	6	-	-	-	2	4	-	Echelberger and Moeller 1977
Adirondack High Peaks (NY)	1974-75	35	5			3			43	14		Snowden 1976
White Mountains (NH)	1977-76	36	10						31	24		Taylor and Mackoy 1980
Bob Marshall complex (MT)	1982	37	8	16	5	10	2	4	11	5		Lucas 1985b
U. S. population	<b>1958</b>	<b>9</b>	<b>12</b>	<b>17</b>	<b>6</b>	<b>12</b>					44	
	<b>1970</b>	<b>6</b>	<b>3</b>	<b>22</b>	<b>3</b>	<b>28</b>	1	25	5	7		
	<b>1980</b>	<b>9</b>	<b>7</b>	<b>21</b>	<b>2</b>	<b>23</b>	1	21	4	12		

<sup>1</sup>Data represent paddle canoeists.

user characteristics. Day-users were slightly more educated than campers, and nonhunters had higher education levels than hunters in the Bob Marshall Wilderness complex (Lucas 1985b). More generally, hikers were more educated than horseback riders or river rafters, and summer visitors were more educated than fall visitors (Lucas 1980, 1985b).

**Occupation.-** Persons in the professional and technical occupations and students were the majority of visitors to most areas (table 10). In many areas 30 to 40 percent of all visitors were professional or technical workers, and from 20 to 30 percent were students, Professionals in wilderness exceeded the proportion in the U.S. population by four to five times, and students were four to seven

times more numerous in wilderness than in the population. Housewives and clerical, sales, and service workers (many of whom are female) were the most underrepresented in wilderness. These patterns reflect the education and gender distribution of wilderness visitors discussed earlier.

Hikers were more likely to be professionals, technical workers, or students than were horse users. In contrast, horse travelers were much more likely to be "blue collar" craftsmen, laborers, and in some areas, farmers. Students formed a larger proportion of wilderness campers than of day-users. Finally, professional and technical workers and housewives were relatively more common in the summer than in the fall. Winter users were most likely to be students.

**Table 11** .-Distribution of family income as a percent of total wilderness visitors by area

Wilderness area (State)	Year	Season	Income (dollars)						Source
			<5,000	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+	
Boundary Waters Canoe Area (MN) <sup>1</sup>	1960	Summer	27	45	19	3	6	0	Lucas 1964a
Bob Marshall (MT)	1970	Summer/Fall	6	30	23	29	-	1 4	- Lucas 1980
Cabinet Mountains (MT)	1970	Summer/Fall	12	45	28	12	-	4	- Lucas 1980
Great Bear (MT)	1970	Summer/Fall	9	19	22	30	-	2 0	- Lucas 1980
Mission Mountains (MT)	1970	Summer/Fall	15	32	26	16	-	1 1	- Lucas 1980
Spanish Peaks (MT)	1970	Summer/Fall	17	29	26	17	-	1 1	- Lucas 1980
Scapegoat (MT)	1970	Summer/Fall	11	42	29	14	-	7	- Lucas 1980
Appalachian Trail (Southern NF's)	1970-71	Summer/Fall	10	24	23	44			Murray 1974
Salway-Bitterroot (MT 8 ID)	1971	Summer/Fall	12	37	25	17	-	1 0	- Lucas 1980
Desolation (CA)	1972	All year	11	24	19	35	-	1 1	- Lucas 1980
Cranberry backcountry (WV)	1972	Spring/Summer/Fall	12	32	35	21			Echelberger and Moeller 1977
Four California Wilderness Areas (CA) <sup>2</sup>	1973		27	15	18	26	-	1 4	- Hendee and others 1976
Adirondack High Peaks (NY)	1974-75	Winter	10	19	23	27	17	4	Snowden 1976
White Mountains (NH)	1977-78	Winter	5	12	20	26	30	7	Taylor and Mackoy 1980
Baxter State Park (ME)	1979	Summer	-	1 6	-	14	33	- 3 7	- Reiling and others 1981
U.S. Population	1960 families		42	43	11	3	1	0.1	U.S. Department of Commerce, 1983
	1970 families		19	32	27	18	4	0.5	
	1980 families		6	13	14	28	32	7	(Statistical Abstract 1982-83)

<sup>1</sup>Data represent paddle canoeists.

<sup>2</sup>Specific areas unidentified.

In Lucas' (1985b) comparative study of visitors to the Bob Marshall Wilderness complex, he found such professional workers as accountants, engineers, doctors, nurses, teachers, religious workers, and scientists to be even more common in 1982 than in 1970. Farmers and craftsmen were also slightly more frequent, and, somewhat surprisingly, the percentage of students and housewives had dropped.

**Income.-** As a group, wilderness visitors have above average incomes (as do most outdoor recreationists) (table 11). This reflects the high education levels and the high proportion of users with professional occupations. There is, however, considerable variation by area. Some areas (such as the Mission Mountains, Spanish Peaks, Scapegoat, Selway-Bitterroot, and Cranberry), have visitors with incomes close to the national average, but others far exceed it. Most eastern area users have high incomes compared to the general U.S. population, as do Desolation visitors in California. These differences reflect the variation in the population's income in the States in which areas are located. Thus, many Montana visitors reflect the country's national income average, but they still exceed their State's average. In some instances, higher than average income figures are in part the result of comparing user incomes in the late 1970's with a 1970 standard. Also, some areas' high incomes result from the type of user they attract. For example, Great Bear is an area with considerable airplane access and the Bob Marshall has heavy horse and outfitter use (Lucas 1980); these uses may be beyond the means of lower income people.

The few studies of winter wilderness users suggest high incomes for them as well.

These high income figures have led some to suggest that wilderness is accessible only to the very wealthy. This, however, is not supported by the data. For most areas studied in 1970, from one-third to one-half of all users had annual incomes below \$10,000, at a time when the median U.S. income was about \$9,000 (Lucas 1980). In addition, it usually costs little to actually use wilderness. Most visitors travel only relatively short distances to reach their wilderness destination (Lucas 1980), and costs per wilderness use-day in the early 1970's were usually low-only about \$10 (Hendee and others 1978).

**Place of Residence.-** Visitors to most wilderness areas are from the State in which the area is located (table 12). In the West, except for the nationally known Glacier National Park backcountry and Colorado's Weminuche Wilderness (located in close proximity to Utah, Arizona, and New Mexico), more than half of all areas' visitors were in-State residents. For many areas, State residents exceeded 75 percent. For California areas, the number was 84 percent or higher. In addition, Lucas (1985b) found that most resident visitors come from the State's regions closest to the wilderness. For example, 60 percent of all visitors to the Bob Marshall Wilderness complex were from Montana, and 54 percent of all its visitors were from northwestern Montana-the region where the areas are located. Thus, in the West, it appears that wilderness recreational benefits are primarily regional in nature.

**Table 12.-** Area of residence and membership in wilderness, conservation, and outdoor clubs as a percent of total visitors by area

Wilderness area (State)	Year	Season	Visitor residence				Club membership	Source
			In-State <sup>1</sup>	Out-of-State	Urban	Rural		
Boundary Waters Canoe Area (MN) <sup>2</sup>	1960	Summer	46	54				Lucas 1964a
Bob Marshall (MT) <sup>3</sup>	1984	Summer/Fall	66	32				Merriam and Ammons 1967
Mission Mountains (MT) <sup>3</sup>	1984	Summer/Fall	80	20				Merriam and Ammons 1967
Glacier NP back- country (MT)	1964	Summer/Fall	19	81				Merriam and Ammons 1967
Glacier Peak (WA)	1965	Summer					25	Hendee and others 1968
Eagle Cap (OR)	1965	Summer					32	Hendee and others 1966
Three Sisters (OR)	1965	Summer					32	Hendee and others 1966
Allagash Wilderness Waterway (ME)	1966		83	37				Cieslinski 1960
	1973	All year	48	52				Cieslinski 1980
	1978		51	49				Cieslinski 1960
Bob Marshall (MT)	1970	Summer/Fall	84	38	85	35	30	Lucas 1980
	1982	Summer/Fall	57	43	61	39	25	Lucas 1985b
Cabinet Mountains (MT)	1970	Summer/Fall	75	25			24	Lucas 1980
Great Bear (MT)	1970	Summer/Fall	53	47			38	Lucas 1980
Mission Mountains (MT)	1970	Summer/Fall	74	26			27	Lucas 1980
Spanish Peaks (MT)	1970	Summer/Fall	71	29			26	Lucas 1980
Scapegoat (MT)	1970	Summer/Fall	86	14			26	Lucas 1980
Selway-Bitterroot (MT & ID)	1970	Summer/Fall	64	36			27	Lucas 1980
Desolation (CA)	1972	All year	93	7			35	Lucas 1980
Appalachian Trail (Southern NF's)	1970-71	Summer/Fall	49	51	68	32		Murray 1974
Yosemite NP back- country (CA)	1973	?	84	16				van Wagendonk 1981
	1976	Summer	12	88				Leonard and others 1976
Great Gulf (NH)								
Indian Peaks back- country (CO)	1976	Summer	77	23				Haas 1978a
	1976-77	Winter	98	4				Haas 1978a
Weminuche (CO)	1977	Summer	33	66	84	15		Brown and Haas 1978
Rawah (CO)	1977	Summer	72	26	67	14		Brown and Haas 1978
Eagles Nest (CO)	1977	Summer	75	22	79	20		Brown and Haas 1978
White Mountains (NH)	1977-78	Winter	27	74			54	Taylor and Mackoy 1980; Taylor and Spencer 1980
Linville Gorge (NC)	1978	Summer/Fall			67	33	38	Roggenbuck and others 1979
Shining Rock (NC)	1976	Summer/Fall			68	32	36	Roggenbuck and others 1979
Joyce Kilmer/Slickrock (NC)	1978	Summer/Fall			77	23	57	Roggenbuck and others 1979
Baxter State Park (ME)	1979	Summer	52	48				Reiling and others 1981
Great Smoky Mountains NP backcountry (NC & TN)	1979	Summer	35	65				Hughes 1985
		Winter	46	54				Hughes 1985
Great Bear (MT)	1982	Summer/Fall	63	37	57	43		Lucas 1985b
Scapegoat (MT)	1962	Summer/Fall	64	36	67	33		Lucas 1985b

<sup>1</sup>In-State means visitor resides in **area's** State(s).

<sup>2</sup>Data for paddle canoeists.

<sup>3</sup>Figures estimated from report's bar graphs.

In the East, many more wilderness visitors were from out of State. This likely reflects both the smaller size of eastern States and the relative scarcity of wilderness resources there. These areas are highly accessible, and demand is high.

Lucas (1980) reported mixed results when he related place of residence to other wilderness use and user characteristics. He expected that horseback travelers, fall visitors, and overnight visitors would more often be out-of-State visitors. In his 1970 study of the Bob Marshall complex, he found more horse users (41 percent) than hikers (30 percent), more hunters (42 percent) than nonhunters (29 percent), and more campers (34 percent) than day-users (16 percent) to be from out of State. In the 1970 sample there were no out-of-State river rafters. By 1982,

user characteristics had changed. Out-of-State horse users and hikers represented about an equal proportion within their use category (about 40 percent), and out-of-State raft use had reached 27 percent. The percent of nonresident hunters remained the same (42 percent), but the percent of out-of-State nonhunters grew to 39 percent. Percentages of nonresident campers and day-users grew to 42 and 29, respectively, in the 1982 study.

**Urban/Rural Residence.-** Most wilderness visitors live in urban areas. Table 12 indicates that for the areas for which data are available, more than 60 percent of all wilderness users reside in urban areas. Brown and Haas (1978) reported that about 80 percent of visitors to three Colorado areas they studied were urban residents. Lucas (1980) reported a range of 45 to 90 percent urban resi-

dents for the nine western areas he studied. Of these, Desolation Wilderness in California had the most urban clientele, and the Great Bear and Cabinet Mountains had the least. In most areas studied (Lucas 1980, 1985b), hikers and rafters were substantially more urban than horsemen, and hunters were less urban than nonhunters.

The high amount of use of wilderness by urbanites does not, however, suggest that wilderness users are disproportionately urban. Most of the U.S. population (about 74 percent) is urban, and urban residents appear to use wilderness in proportions about equal to their numbers of the general population. For example, Lucas (1985) found that 50 percent of the Montana visitors to the Bob Marshall complex were from urban areas; 51 percent of Montana population is urban. At the same time, 74 percent of the area's out-of-State visitors were urban residents, a proportion equal to that of the urban population of the United States.

**Club Membership.-** Some have suggested that wilderness visitors are predominantly members of specialized interest groups such as wilderness, conservation, and outdoor recreation clubs. Research refutes this contention. For most areas for which data are available, only 20 to 35 percent of the users belong to any sort of outdoor club (table 12). In the East, these percentages seem somewhat higher. For example, over 50 percent of both winter recreationists in the White Mountains backcountry and the visitors to Joyce Kilmer-Slickrock Wilderness belong to a conservation or recreation club. This likely reflects the unusually high educational levels, incomes, and urban nature of the areas' visitors.

Lucas (1980) examined the type of outdoor club to which members belonged, and found considerable variation across areas. In many areas, visitors belonged primarily to local rod and gun clubs. For example, only about 28 percent of the club members among visitors to the Bob Marshall Wilderness complex belonged to a wilderness-oriented club (Lucas 1985b). In contrast, over half of the outdoor club members among visitors to the Desolation and Mission Mountains Wildernesses and the Spanish Peaks Primitive Area belonged to a national wilderness-oriented organization like the Sierra Club or The Wilderness Society. Lucas (1985b) also found that Bob Marshall horsemen were more likely to be club members than were hikers. Also, while hunters and nonhunters in the Bob Marshall were similar in percentage of outdoor club membership, hunters were less likely to be members of wilderness organizations and more likely to belong to rod and gun clubs.

**Previous Wilderness Experience.-** As table 13 indicates, most wilderness users have considerable experience. For the western areas, between 70 and 90 percent of visitors had made at least one previous visit to a wilderness or wildernesslike area. These percentages were slightly lower for some eastern areas. The amount of previous experience in the study area varied a great deal. For many areas, about 30 or 40 percent had made no previous visits to the study area, but in some wildernesses, this number reached 60 percent. The areas with the high percentage of first-time users tended to be those, that had been designated as wilderness more recently. Many areas also had between 20 and 30 percent of their visitors who

had made six or more visits. These percentages dropped to 10 to 20 for some more recently established areas.

Lucas (1980) and Hende and others (1968) have also reported age of first visit to wilderness, the average number of visits to wilderness per year, and number of days spent in wilderness for several western wilderness areas. Typically, between one-third and one-half of the wilderness users made their first visit before their 16th birthday. Parents were important in introducing their children to wilderness, but more often visitors first went to wilderness with a friend or organization. The parents' influence might be greatest through their car camping practices. Between 50 and 60 percent of the wilderness visitors studied said their parents took them car camping when they were young. In comparison, only about 20 percent of the national population car camps.

Visitors averaged three or four wilderness visits per year, and spent a total of 6 to 10 days in wilderness (Lucas 1980). This suggests fairly frequent and fairly short trips. Hikers in the Bob Marshall Wilderness complex tended to make more trips each year than horse users, but their trips were shorter (Lucas 1985b). Hikers also were more experienced, and were introduced to wilderness at a younger age.

**Type of Group.-** Wilderness user groups composed of the family or family and friends make up the majority of all groups in virtually all areas (table 14). An exception to this are users of the three wilderness areas studied in western Wyoming (Manfredo 1978b); here, classes from the National Outdoor Leadership School contribute to low proportions of families. About half of all groups contain children. Family groups by themselves often account for about 40 percent of all groups. The second most frequent user group overall and the most frequent in Montana's Great Bear, Wyoming's Popo Agie, Bridger, and Fitzpatrick Wildernesses, and Great Smoky Mountains National Park backcountry are groups of friends. Organized groups or clubs like outing clubs, Boy Scout or Girl Scout groups, or church groups generally make up 10 percent or less of all groups. In many areas such groups account for less than 5 percent. The percentage of visitors who are alone varies somewhat by area, but in most places is less than 10 percent. In some areas, almost no one travels alone. Exceptions are user groups in the Great Smoky Mountains, Eagles Nest in Colorado, and the Popo Agie, Bridger, and Fitzpatrick in Wyoming, where between 10 and 20 percent are alone.

The patterns of type of group vary by method of travel, day or overnight use, and season of use (Lucas 1985b). In the Bob Marshall Wilderness complex the few solitary visitors are more likely to be hikers than horse users. Summer visitors were twice as likely to be alone, and day users in the wilderness complex were more likely groups of friends, but by 1982 the proportion of family groups and groups of friends was similar for horse users and hikers. Groups of friends were more numerous in fall in the 1970 study, but by 1982, family groups were as common in the fall as in the summer. These figures and trends suggest that the predominance of the family is growing in wilderness, that family use is spreading more uniformly across seasons and travel patterns, and that strengthened family ties may be an increased benefit of wilderness.

**Table 13.-** Previous wilderness experience as a percent of total visitors by area

Wilderness area (State)	Year	Season	Previous visits to wilderness	Previous visits to study area				Source
				0	1-2	3-5	6+	
Boundary Waters Canoe Area (MN) <sup>1</sup>	1960	Summer		13				Lucas 1964a
Bob Marshall Wilderness complex (MT)	<sup>2</sup> 1970	Summer/Fall	78	45	16	17	20	Lucas 1980
	<sup>2</sup> 1982	Summer/Fall	78	58	18	14	14	Lucas 1985b
Cabinet Mountains (MT)	1970	Summer/Fall	85	37	17	13	33	Lucas 1980
Great Bear (MT)	1970	Summer/Fall	75	61	13	7	19	Lucas 1980
Mission Mountains (MT)	1970	Summer/Fall	80	45	21	13	21	Lucas 1980
Spanish Peaks (MT)	1970	Summer/Fall	61	50	17	10	23	Lucas 1980
Scapegoat (MT)	1970	Summer/Fall	73	61	17	9	13	Lucas 1980
Selway-Bitterroot (MT & ID)	1971	Summer/Fall	76	43	13	14	30	Lucas 1980
Desolation (CA)	1972	All year	69	30	23	17	30	Lucas 1960
Cranberry backcountry (WV)	1972	Spring/Summer/Fall		75				Echelberger and Moeller 1977
Adirondack High Peaks (NY)	1974-75	Winter	70	0	59	24	17	Snowden 1976
Indian Peaks backcountry (CO) <sup>3</sup>	1976	Summer		51	24	14	11	Brown and others 1977
Weminuche (CO) <sup>3</sup>	1977	Summer		30	- 5	4 - 1	6	Haas 1978b
Eagles Nest (CO) <sup>3</sup>	1977	Summer						Manfredo and Haas 1978
Dillon District <sup>4</sup>				45	22	23	10	
Holy Cross District <sup>4</sup>				31	20	28	21	
Rawah (CO) <sup>3</sup>	1977	Summer		60	20	6	4	Manfredo 1978a
Linville Gorge (NC)	1976	Summer/Fall	88	39	11	16	33	Roggenbuck and others 1979
Shining Rock (NC)	1978	Summer/Fall	43	35	14	21	30	Roggenbuck and others 1979
Joyce Kilmer/Slickrock (NC)	1976	Summer/Fall	82	80	12	19	9	Roggenbuck and others 1979
Popo Agie (WY) <sup>3</sup>	1978	Summer		55	30	10	5	Manfredo 1978b
Bridger (WY) <sup>3</sup>	1978	Summer		62	23	8	7	Manfredo 1978b
Fitzpatrick (WY) <sup>3</sup>	1978	Summer		78	16	3	3	Manfredo 1978b
Maroon Bells-Snowmass (CO) <sup>3</sup>	1978	Summer		68	21	- 1	1 -	Haas and others 1982
Great Smoky Mountains NP backcountry (NC & TN)	1963	Summer		34	24	13	28	Burde and Curran 1966

<sup>1</sup>Data represent paddle canoeists.

<sup>2</sup>Bob Marshall complex includes the Bob Marshall, Great Bear, and Scapegoat Wildernesses.

<sup>3</sup>Experience levels refer to visits to the study area within the past 12 months.

<sup>4</sup>Previous visits categories are 0,1, 2-6, 7 + .

## Wilderness Knowledge

Research to determine the knowledge base of wilderness visitors and the general public is scarce. This knowledge may influence attitudes and, especially, behavior concerning wilderness and has important implications for understanding wilderness use and managing it.

There are a few studies that provide information on three types of knowledge relative to wilderness: (1) wilderness definitions, (2) appropriate practices in wilderness and related regulations, and (3) the natural role of wildfire. There is apparently no research on public knowledge of alternative wilderness or similar nonwilderness opportunities, or alternative locations within a particular wilderness, although there have been several studies of how visitors respond to information about various parts of a wilderness (Schomaker 1975; Lime and Lucas 1977; Lucas 1981; Roggenbuck and Berrier 1981; Krump and Brown 1982).

**Wilderness Definitions.-** In general, wilderness visitors have more accurate information about wilderness definitions than the general public has, and the public in areas close to a number of wildernesses has more accurate information than people who live far from wilderness. Young (1978) found that the general public in Illinois had little knowledge of the basic definitions of wilderness. Many were unaware that logging and mechanical recreation generally were banned. Keegan and others (1982) found higher knowledge of wilderness characteristics among the general public in Montana; 70 percent of those polled reported they had personally visited some of the State's many wildernesses. About 16 percent had visited a classified wilderness in the previous year, and about 40 percent had done so at some time.

Stankey (1973) and Robertson (1981) both found fairly high knowledge levels among wilderness visitors, although Stankey reported considerable variation among his four study areas.

**Table 14.-** Type of group as a percent of total groups by area

Wilderness area (State)	Year	Season	Type of group						Source		
			Family	Family and friends	Friends	Organized group or club	Alone	Information missing			
Glacier Peak (WA), Eagle Cap (OR), Three Sisters (OR)	1965		-	4	7	-	38	8	7	Hendee and others 1968	
Bob Marshall Wilderness complex (MT)	1970	Summer/Fall	43	15	30	2	6	4	Lucas 1980		
Cabinet Mountains (MT)	1982	Summer/Fall	-	5	5	-	36	3	6	0	Lucas 1985b
Great Bear (MT)	1970	Summer/Fall	40	15	33	5	5	1	Lucas 1980		
Mission Mountains (MT)	1970	Summer/Fall	24	14	62	0	0	0	Lucas 1980		
Spanish Peaks (MT)	1970	Summer/Fall	46	17	29	2	2	5	Lucas 1980		
Scapegoat (MT)	1970	Summer/Fall	38	13	35	4	5	5	Lucas 1980		
Selway-Bitterroot (MT & ID)	1970	Summer/Fall	36	21	28	8	6	1	Lucas 1980		
	1971	Summer/Fall	40	14	37	3	5	1	Lucas 1980		
Desolation (CA)	1972	All year	33	17	32	8	5	5	Lucas 1980		
Boundary Waters Canoe Area (MN)	1974	Summer	-	6	1	-	27	11	1	Hendee and others 1978	
Weminuche (CO)	1977	Summer	44	13	27	11	5	Haas 1978b			
Eagles Nest (CO)	1977	Summer						Manfredo and Haas 1978			
Dillon District			40	10	37	2	11				
Holy Cross District			28	8	40	4	20				
Rawah (CO)	1977	Summer	47	5	37	3	7	Manfredo 1978a			
Popo Agie (WY)	1978	Summer	25	14	47		15	Manfredo 1978b			
Bridger (WY)	1978	Summer	27	7	49		16	Manfredo 1978b			
Fitzpatrick (WY)	1978	Summer	19	7	53		20	Manfredo 1978b			
Maroon Bells-Snowmass (WY)	1978	Summer	42	10	37	1	10	Haas and others 1982			
Baxter State Park (ME)	1979	Summer	-	<sup>2</sup> 5	6	-		3	Reiling and others 1981		
			-	<sup>3</sup> 5	1	-		8			
Great Smoky Mountains NP backcountry (NC & TN)	1983	Summer	-	4	0	-	44	16	Burde and Curran 1986		

<sup>1</sup>Bob Marshall complex includes Bob Marshall, Great Bear, and Scapegoat Wildernesses.

<sup>2</sup>Resident figures.

<sup>3</sup>Nonresident figures.

**Appropriate Practices in Wilderness and Related Regulations.-** McAvoy and Hamborg (1984) found Boundary Waters Canoe Area Wilderness visitors were quite knowledgeable about regulations in the area, Persons reporting the Forest Service as their main source of information had higher knowledge levels. Brochures were effective at communicating; personal contact added little. Robertson (1981) also found fairly high knowledge of recommended low-impact camping practices among visitors to the Three Sisters Wilderness in Oregon, and she found that knowledge predicted behavior far better than other variables tested.

Hill (1975) found limited knowledge of low-impact practices among University of Utah students who were beginning a class in backpacking skills. Littering behavior was the only topic about which students had good knowledge. Lucas (1985b) found an increase in Bob Marshall Wilderness complex visitors' knowledge about garbage handling (packing it out rather than burying it) from 1970 to 1982. In 1970, most visitors thought burying was appropriate, but by 1982 this practice was rejected by a 2 to 1 margin. Stankey (1979) reported that 40 percent of the 1973

visitors to the San Geronio and San Jacinto Wildernesses in California were unaware of a use rationing system instituted that same year.

**The Natural Role of Wildfire.-** Stankey (1976) found poor knowledge about wilderness fire and its effects, but similar to Robertson (1981), he found that support for a policy of allowing fire to more nearly play its natural role was associated with greater knowledge of fire; McCool and Stankey (1986) found that Selway-Bitterroot Wilderness visitors' knowledge of wilderness fires increased considerably from 1971 to 1984. The positive association of knowledge about fire and attitudes supporting prescribed fire found in the earlier study was confirmed for 1984 visitors.

## Use Measurement

Reasonably accurate basic recreational use data are widely recognized as essential to professional management of most wildernesses. Despite the importance of use data, for years managers of many areas have made do with data of low accuracy.

**Managers' Use Estimation Techniques.-** Five general methods of estimating wilderness recreational use are commonly used by managers:

1. Casual observation and best guesses. Managers or fieldworkers try to recall how many visitors they saw, wherever and whenever they happened to be in or around the wilderness, and then conjure an estimate, usually using last year's reported use as a starting point. Use of this method is motivated by agency requirements for a report of use each year, not by any need to employ use data in management activity. This description may seem harsh, but this method has been one of the most commonly used systems throughout the last 20 years.

2. Recorded observation and systematic "guesstimates." Agency personnel keep notes of visitor numbers, particularly counts of parked cars at access points, usually when duties take them there, rather than on a planned sampling schedule. Some mathematical expansion factors are applied to the recorded observations to produce a use estimate.

3. Trail register data. Data from voluntary, unstaffed trail registers are summarized. Usually some expansion is made for nonregistration. However, registration behavior is usually not observed and an assumed rate is generally used. Often one expansion factor is applied to totals, rather than several separate factors applied to particular types of visitors with different registration rates, such as horseback riders and hikers, day-users and campers, and so on (Wenger and Gregersen 1964; Lucas and others 1971; Leatherberry and Lime 1981; Petersen 1985).

4. Wilderness permits. Permits are used where use is controlled; for example, camping in the backcountry of many major National Parks, all use of the Boundary Waters Canoe Area, and several wildernesses managed by the Forest Service in the southern Appalachians. Permits are also used in several wildernesses where use is unrestricted; for example, all National Forest wildernesses in California (only a few of which control use). Permits, in addition to their other uses, provide managers with recreational use data that are usually the most accurate of all use estimates. Sometimes adjustments are made for non-compliance and variation between planned and actual use (Lime and Lorence 1974; Kraushaar and others 1979; van Wagendonk and Benedict 1980).

5. Trail traffic counters. Several kinds of automatic counters, such as pressure pads and infrared beam counters, are used to estimate numbers of visits (Leonard and others 1980), but estimates of visitor-days require other data on length of stay, either from trail registers or guesses, to multiply times visits.

**Researched Use Estimation Techniques.-** Researchers have used additional approaches that have been used infrequently by managers and also have studied the relation of actual use to data from trail registers and permits.

1. Direct observation. One such approach is personal observation as part of a formal systematic sampling plan. The sample is usually stratified by weekday/weekend, season, and perhaps access point or groups of accesses. This approach can produce estimates to any desired level of accuracy, but even for fairly modest accuracy, it usually requires considerable sampling intensity. Resulting high

costs have limited usefulness of the method to managers (Lucas and others 1971; Leonard and others 1980).

2. Time-lapse photography. A movie camera is modified to expose one frame of film at a selected interval. The method has been used primarily to record river recreational use, and has been quite successful (Marnell 1977; Marnell and others 1978). This is because long stretches of rivers can often be photographed so that exposures evenly spaced at relatively long time intervals will not result in any parties going by unobserved. This is seldom the case on trails. There, exposure intervals close enough to record all visitors would exhaust film quickly, with most frames showing no visitors.

3. Cameras automatically triggered by traffic counters. A modified movie camera exposes a frame or two whenever a trail traffic counter, usually an infrared beam counter, is activated by passing visitors (or wildlife, including one grizzly bear on a Bob Marshall trail). The technology was developed originally by the Forest Service Equipment Development Center in Missoula, MT (DeLand 1976; Gasvoda 1978). It has been used in a number of research studies (Leonard and others 1980; Leatherberry and Lime 1981; Lucas and Kovalicky 1981; Petersen 1985). Film is not used unnecessarily when no visitors are there, and persons classifying recreational traffic by viewing the film do not have to search through hundreds of frames to find those showing visitors. Automatic cameras can be used to directly record use or measure trail register registration rates, which is discussed further below. This method has been used mainly on trails, but can be used on fairly narrow streams, where the traffic counter's maximum range of 90 to 120 feet is not exceeded.

More information is obtained than from traffic counters alone. Method of travel—for example, hiking or horseback—can be determined and length of stay—day-use or camper—can usually be identified from presence or absence of large backpacks or pack horses. Direction of travel is obvious. Usually party size can be determined.

Equipment costs are significant for traffic counters, cameras, and film editors or special projectors (Leonard and others 1980) and care in installation is important. But a nearly complete record of use near an access point usually is produced at total costs well below personal observation, and without the boredom or hardships of enduring all sorts of weather that would afflict an employee sitting on a log hour after hour.

Concerns for privacy are critical. The usual guidelines suggested by agency attorneys are to: use the system only to measure and classify recreational visitor traffic, place the camera far enough from passing visitors or adjust the focus so that 8-mm photo quality is not good enough to identify individuals, and destroy the film after it has been viewed and traffic tallied (Leonard and others 1980). Apparently these guidelines have been observed reasonably well because controversy has been very limited.

This is an effective and reasonably cost-efficient system that has been adopted by many wilderness managers.

4. Formal systematic observation of visitor registration behavior. As early as 1961, researchers began studying visitors' responses to voluntary, unstaffed trail registers (Wenger 1964). The concept, still applicable today, was

that trail register data provide a base that could be adjusted by a mathematical operation to estimate total use if visitor registration rates were known.

Actual registration behavior was determined in several ways. Several early studies conducted brief interviews to collect the same type of information called for on the trail register, with interviews conducted far enough beyond the trail register to be out of sight of parties at the register and avoid influencing behavior (Wenger 1964; James and Schreuder 1971; Lucas and others 1971). Observation with binoculars was used in one study (Thorsell 1958). Pressure-plate traffic counters were tried (Lucas and others 1971; Leonard and others 1980), as were prototype ultrasonic traffic counters (Lucas and others 1971) and infrared beam traffic counters (James and Schreuder 1971). The most common technique in recent years, and the most effective, has been the movie camera triggered by an infrared beam trail traffic counter (Leonard and others 1980; Leatherberry and Lime 1981; Lucas and Kovalicky 1981; Lucas 1983; Petersen 1985).

A number of studies of registration behavior produced variable results (table 15). Overall registration rates in different wildernesses and other wild, roadless, backcountry areas, with various types of registration stations, ranged from a low of 18 percent in the Idaho Primitive Area, to a high of 89 percent in the Rawah Wilderness in Colorado.

The study results in table 15 suggest, at first glance, that registration rates have declined irregularly over the years. However, there may be little or no time effect. What probably accounts for most of this variation is the

relative proportions of different types of use occurring in each study area. As table 15 shows clearly, there are large differences in registration rates among different types of visitors. Specific registration rates vary in response to local differences in registration stations and basic characteristics of user populations, but the pattern of relative registration rates is consistent to a degree that is rare in recreation research. Hikers always register at substantially higher rates than horse users. Campers always have higher registration rates than day-users. When method of travel and length of stay are considered in combination, camping hikers (backpackers) lead the list, followed by day hikers, and camping horse users; day horse users always have very low, often 0 percent, registration. The only test of self-issued mandatory permits (Lucas and Kovalicky 1981) had a slightly different order due to high registration by camping horse users. (Mandatory self-issued permits, used a few places primarily in the West, differ from trail registers in that they are mandatory rather than voluntary. A copy of the permit is supposed to be carried by the visitor for possible field checking, while another copy is deposited at the permit-issuing station.) Hunters, partly reflecting the travel-stay relationship, have low rates, much lower than nonhunters, and partially as a result, fall registration rates are lower the summer rates, with the one exception of the only study of self-issued permits (Lucas and Kovalicky 1981). Larger parties, at least up to moderately large groups, register at a higher rate than small parties, and single visitors have the lowest rate of all.

Table 15.- Reported percentage registration rates from studies of visitors' responses to trail registers

Wilderness area (State)	Year	Visitor types							
		All visitors	Hiker	Horse users	Day-use	Camper	Day hiker	Day horse users	Camping hiker
Three Sisters (OR), Mountain Lakes (OR)	1961-62	74	79	40	78	81	78	-	81
Mission Mountains (MT)	1988	85	66	44	83	74	—	—	
Banff NP (AB)	1988	35	-	-	-	-	—	—	
Rawah (CO)	1970	89	-	-	-	-	—	—	
Selway-Bitterroot (ID & MT)	1974	28	31	11	19	49	—	—	-
Idaho Primitive Area (ID)	1975	18	-	—	-	—	—	—	-
	1978	35	-	—	-	—	—	—	-
	1977	23	-	-	-	—	-	-	-
Sawtooth (ID)	1975	78	-	33	-	—	85	-	87
Waterton Lakes NP (AB)	1978	78	78	84	-	—	-	-	-
Spanish Peaks (MT) (Spanish Creek, July-Aug. only)	1977	50	58	14	32	74	40	0	78
Spanish Peaks (MT) (self-issued mandatory permits)	1978	53	55	35	45	72	51	25	72
McCormick Forest (MI)	1978-79	88	88	-	-	-	-	-	-
Bob Marshall (MT) (7 trails)	1981	20	39	7	18	20	24	0	47
Bob Marshall (MT) Conventional trail register, at trailhead	1982	32	34	8	21	54	23	0	57
Newly designed register, 1 to 3 miles up trail		89	80	50	55	74	85	14	88

<sup>1</sup>All visitors to the McCormick Forest were hikers.

**Table 15.-** (Con.)

Camping horse users	Visitor types							Weekday	Weekend	Source
	Summer	Fall	One-person parties	Small groups (2/2-3)	Medium groups (3-4/5-6)	(6-7)	Large groups or more)			
-	-		37	73	62		64	72	76	Wenger and Gregersen 1964
-	74	41	55	63	72		66	72	62	Lucas and others 1971 Thorsell 1968
-			10	-	35	-	17	<b>30</b>	<b>26</b>	James and Schreuder 1972 Lucas 1975
	50	21	-	-	-		-	--	--	Personal communications, Dodds
	35	15	-	-	-		-	--	--	
50	-		-	-	-		-	--	--	Mullins 1975 Scotter 1981 Lucas (unpublished); Lucas and Kovalicky 1981
70	53	53	41	-	5	7	-	60	--	Lucas and Kovalicky 1961
7	72	57	-	6	0	-	64	100	-	Leatherberry and time 1961 Lucas 1963
	35	5							--	
20			--	--	--		--	--	--	Petersen 1965
56	-		--	--	--		-	--	--	

The areas where high registration rates have been reported are primarily backpacking wildernesses, with few horse users. These include Three Sisters, Mountain Lakes, Mission Mountains, Rawah, and Sawtooth Wildernesses, Waterton Lakes National Park, and McCormick Forest (table 15). The lowest overall registration rate for any of these areas was 65 percent. Areas with substantial horse and hunter use include the Selway-Bitterroot and Bob Marshall Wildernesses and the Idaho and Spanish Peaks Primitive Areas. At these areas, registration rates ranged from 18 to 50 percent, with most at the lower end. The only exceptions were the self-issued permit test in the Spanish Peaks (Lucas and Kovalicky 1981) (53 percent), and the experimental registration station tested by Petersen (1985) in the Bob Marshall (69 percent).

Locating trail registers some distance up a trail, rather than near the trailhead, appeared to result in higher registration rates in studies in the Sawtooth Wilderness (Mullins 1975) and the Spanish Peaks Primitive Area (Lucas and Kovalicky 1981). Petersen (1985) tested location in a controlled experiment. Two types of trail registration stations were moved from trailheads several miles up the trail and back on a random basis. Her results showed conclusively that up-trail locations produced substantially higher registration rates than trailhead locations. When the new station design was placed up the trail, registration rates more than doubled from rates at the old standard station at the trailhead.

Trail register messages also influence visitor registration behavior. Scotter (1981) and Lucas and others (1971) in-

dicated that lack of understanding of the reasons for registration was a major reason for nonregistration; Petersen (1985) designed a sign (fig. 2) that presented three reasons very briefly, and visitors responded with higher registration rates. (The standard sign, which gave only a very general reason, read, "This will help us meet your needs in the area.") Camping horse users, in particular—usually a difficult group to get to register—more than doubled their registration rate.

Mathematical approaches to generating use estimates from trail register data suggest that simple procedures, regression or ratio estimation, work just as well as more complex techniques (James and Schreuder 1971, 1972; Lucas and others 1971).

5. Road traffic checks. This technique, sometimes called a "cordon line," involves gathering data on visitor traffic on access roads to a wilderness or similar area, through brief roadside interviews, and using these data as a base for estimates of total use and its characteristics. It is most practical for areas with only a limited number of access roads, especially roads that dead-end at the wilderness, and carry limited nonrecreational traffic. Sometimes road traffic counters have been used to aid in the expansion of interview data (Lucas 1964a). In other cases, traffic counters were not used, and interviews at roadblocks were used to estimate amount and type of use (Cushwa and others 1965). The technique is effective, but it is a major undertaking and costs can be substantial. This approach has not been used by managers.



Figure 2.- Experimental trail register design (from Petersen 1985).

## Trend Analysis

Studies of trends in wilderness use and user characteristics have been scarce. Because of the problems described above with basic use data of low accuracy, lack of comparability between wilderness-managing agencies, and discontinuities over time, analyses of trends in amount of wilderness recreation use have been hampered.

Before passage of the Wilderness Act in 1964, the only established wilderness was in National Forests. The National Park Service and Fish and Wildlife Service had some lands designated as wilderness later, and the Bureau of Land Management much later after passage of the Federal Land Policy and Management Act in 1976. However, other than the Forest Service, none of the agencies have reported recreational use specifically for wilderness units. Thus, the data on use of National Forest wilderness are the main available record of recreational use and trends. Data began in 1946 and are available for every year thereafter, although units of measure changed from 1964 to 1965, and number of visits were not reported after 1969. Reported figures show some erratic ups and downs (table 16), and visits and man-days do not always parallel each other as one would expect unless lengths-of-stay were fluctuating sharply. The first years after the switch to 12-hour recreation visitor-days show curious changes. Average length of stay in 1966 was 3.4 12-hour days, but in 1967 the average dropped to 2.3. These shifts

back and forth raise some concerns about accuracy, but, as the saying goes, "It's the only game in town." Taking the figures at face value, the rates of increase were highest in the 1940's and 1950's, with double-digit increases most years; slowed somewhat in the 1960's and 1970's, with single-digits most common; and decreases for several years. In the 1980's, decreases became more common than increases, despite additions to the wilderness system.

National Parks have reported overnight stays in back-country, whether classified as wilderness or not, since 1971. Much of this use is essentially wilderness use, and most of it is in areas that may eventually become official wilderness. The trend for the major wilderness-type parks was steadily upward to a peak in 1976 (table 17). Since 1976, use has declined about one-third, and, except for a rebound in 1980, the downward trend has been steady.

Reasons for these declines are not clear. The trends for National Park and National Forest use (table 1) are rather different; since 1976, even the direction of change has been different in all but 2 years-1982 and 1983. If broad social-economic changes were causing decreased recreational use of wilderness-type lands, one would expect more parallel changes. Additions to National Forest wilderness could cause some differences in trends, but most of the areas were added in 1984 and are not reflected in the data in table 1. Large Alaskan areas were added in 1980, but their use was light, only 3 to 4 percent of all National Forest wilderness use most years.

McCool(1985) examined the hypothesis that wilderness designation causes a spurt in recreational use, "a kiss of death" of sorts. He had use data for years before the Rattlesnake Wilderness, MT, was designated-the only case where such data existed-as well as after designation. He found little change, and concluded that the designation effect is not inevitable.

Petersen (1981) approached the designation effect by tracing rates of change in reported use for newly designated National Forest wildernesses to determine if new areas showed more rapid increases than long-established areas. Most did, but the effects were variable and not as large as common speculation would have suggested. Studies of trends in use and user characteristics are almost as scarce, and most include only a few characteristics and rather short time periods.

Changes in numbers of visitors for the main types of use in the Boundary Waters Canoe Area from 1961 to 1966 were studied by Lucas (1967). Total use increased 19 percent, but paddling canoeists and boat campers both increased about 55 percent. Use in 1966 was more evenly distributed among access points than in 1961. More visitors came from outside Minnesota, parties became slightly larger, and stays became shorter over the 5 years.

Use of the Allagash River, ME, more than doubled from 1966 to 1975, parties became smaller, and stays shorter (Cieslinski 1980). Visitor surveys in 1973 and 1975 included data on only eight variables, with little change except a decline in the number of large parties.

Use of the Rattlesnake Wilderness grew slightly from 1977 to 1981, and groups grew smaller (Corti and others 1982). Limited visitor surveys in 1978 and 1981 showed few changes, except a tendency for 1981 visitors to have less previous experience in the area than 1978 visitors.

**Table 15.-** Reported annual total use of National Forest wilderness and primitive areas, in thousands, and percent change between years

Year <sup>1</sup>	Man-days		Visits		Recreation visitor days	
	Thousands	Percent change	Thousands	Percent change	Thousands	Percent change
1946	406		144			
1947	499	+23	194	+35		
1948	657	+32	213	+10		
1949	761	+16	244	+15		
1950	787	+3	246	+8		
1951	609	+15	312	+27		
1952	953	+18	387	+24		
1953	1,317	+38	406	+5		
1954	1,047	-21	396	- 3		
1955	1,175	+12	462	+17		
1956	1,364	+16	448	- 3		
1957	1,654	+21	535	+19		
1958	1,685	+2	556	+4		
1959	1,950	+16	562	+1		
1960	1,903	- 2	614	+9		
1961	2,047	+6	757	+23		
1962	2,136	+4	615	+8		
1963	2,752	+29	937	+15		
1964	2,672	+4	957	+2		
1965			NA		4,522	
1966			1,392	<sup>2</sup> +45	4,791	+6
1967			2,029	+46	4,696	- 2
1968			2,026	0	5,056	+8
1969			<sup>3</sup> 2,026	0	5,072	0
1970					5,643	+15
1971					6,691	+15
1972					6,459	- 3
1973					6,682	+3
1974					6,743	+1
1975					7,513	+11
1976					7,106	- 5
1977					8,008	+13
1978					8,620	+8
1979					9,605	+11
1980					9,268	- 4
1981					11,417	+23
1982					11,156	- 2
1983					9,909	-11
1984					10,209	+3

<sup>1</sup>Years are calendar years through 1976 and fiscal years (October through September) thereafter.

<sup>2</sup>Percent change for a 2-year period.

<sup>3</sup>Reported visit totals for 1968 and 1969 were identical; this is not an error.

Use of Yosemite National Park's backcountry rose rapidly to 1975, but declined from then to 1979 (van Wagtendonk 1981). (Park Service annual use reports show backcountry camping has since risen and declined again.) Two separate surveys only 2 years apart (1973 and 1975-76) showed little change in age, education, income, party size, and length of stay. There were more female visitors in the latter survey, and use was a little more evenly distributed over the season and over the trail system.

In 1970 and 1982, comprehensive visitor surveys were carried out in the Bob Marshall Wilderness complex, which includes the Bob Marshall, Great Bear, and Scapegoat Wildernesses in Montana (Lucas 1985b). The major change in use characteristics was a shift from predominantly horse use in 1970 to mainly backpacker use in 1982. Both

horse and hiker use increased, but hiker use grew much faster. Many other changes seemed to stem from this basic shift: shorter stays, smaller parties, a smaller proportion of visits with outfitters, some shift in activities from more consumptive to more contemplative, more summer and less fall use, and less dependence on wood fires. Other changes in use characteristics were: less weekend peaking and less concentrated use. These changes seemed to imply lower potential for impacts to resources on a per-party basis.

Most visitor characteristics remained about the same or changed only moderately from 1970 to 1982. The essentially unchanged characteristics included urban/rural residence, type of social group, age distribution, high levels of overall wilderness experience, and club membership. Modest changes from 1970 to 1982 included more visitors

**Table 17.-** Reported total annual use of wilderness and backcountry in 17 major National Parks'

Year	Overnight stays	
	Thousands	Percent change
1971	712	
1972	857	+20
1973	910	+6
1974	1,027	+13
1975	1,115	+9
1976	1,231	+10
1977	1,098	-11
1978	904	-18
1979	902	0
1980	996	+10
1981	968	-3
1982	881	-9
1983	865	-2
1984	a33	-3

<sup>1</sup>Includes data from Big Bend, Denali (Mt. McKinley), Everglades, Glacier, Grand Canyon, Grand Teton, Great Smoky Mountains, Kings Canyon, Mount Rainier, North Cascades, Olympic, Rocky Mountain, Sequoia, Shenandoah, Voyageurs, Yellowstone, and Yosemite National Parks.

from out of State, more women, higher educational levels, more visitors in professional and technical occupations, and less previous experience in the Bob Mar&all Wilderness complex, especially for backpackers. These changes also reflect the shift to more backpacker use. Many changes in visitor characteristics seem to point to slower future growth in use.

Burde and Curran (1986) studied changes in use, users, and attitudes in Great Smoky Mountains National Park's backcountry from 1973 to 1983. Visitors in 1983 were older, more experienced, more often with peer groups of friends than family groups, and in smaller groups. Slightly more women visited the backcountry in 1983, and average trip length was about the same across the two study periods.

## Projections

Projections of wilderness recreational use have been limited by poor and noncomparable basic use data, and also by scanty knowledge of the relationship of wilderness use to causal factors.

Probably the earliest projection of wilderness use was made as part of the Forest Service National Forest Recreation Survey project in 1961 (USDA-FS 1961). An unpublished projection of National Forest wilderness use foresaw a tripling of man-days by 1976 and more than eightfold growth by the year 2000 (table 18). This is a little more than a 5 percent average annual rate of increase. The actual reported figure for 1976 was 7,105,600 12-hour visitor-days, compared to 5,804,000 man-days—a different unit of measure. There is no way to convert from one unit to the other with any precision because fractional man-days had highly variable definitions in visitor hours, but a suggested rule of thumb is 1.5 visitor-days per man-

**Table 18.-** National Forest wilderness use projections in thousands of man-days and percentage change projected

	1959 (actual)	1976	Percent change	2000	Percent change
National Forest Recreation Survey (1961)	<sup>1</sup> 1.950	5,804	+198	16,183	+730
Outdoor Recreation Resources Review Commission (1962)	<sup>1</sup> 1.399	4,948	+254	12,053	+762

<sup>1</sup>The National Forest Recreation Survey included data for all areas; the ORRRC study excluded areas smaller than 100,000, then called "Wild Areas."

day (Hendee and others 1978, p. 289). Using 1.5 as a rough conversion factor suggests projected 1976 use of about 8,700,000 visitor-days, or about 22 percent more than was actually reported.

The projection technique was based on simple assumptions, with no supporting research (there was no recreation research to speak of in 1959). Per capita use was projected by multiplying the ratio of projected per capita real income in the target year to its level in the base year times, similar ratios for leisure and miles traveled. The result was multiplied by projected population. This procedure illustrates another problem in recreation projections; the procedure requires projections of population, income, leisure, and travel, variables that are probably as hard to project as recreation use itself. The "independent variables" also are obviously not independent of one another.

At almost the same time, wilderness use was projected as part of the Outdoor Recreation Resources Review Commission (ORRRC 1962) studies. They also worked only with National Forest data (no wildernesses were managed by any other agency before 1964), and also used man-days. These projected rates of increase were similar to those of the Forest Service study (USDA-FS 1961) (table 16). This is surprising because the projection procedures were quite different. The ORRRC projections were based only on income and population. Per capita wilderness use was related to income with a regression model, using National Forest-reported wilderness and primitive area man-days from 1947 to 1959. These predictions of per capita use were multiplied by projected population.

There appears to have been almost a 20-year gap before other wilderness use projections were developed in response to Resource Planning Act (RPA) requirements. Three projection studies were published in 1982 or 1983, all of them using more advanced statistical techniques than the early studies. Jungst and Countryman (1982) developed several models. One approach used timeseries cross-sectional regression, with both supply and demand variables, with a resulting projected average annual rate of increase of 2.6 percent to the year 2020. The second approach used regression analysis, using supply, population, and lagged wilderness use (use in the previous year) as independent variables. This model projected an average annual rate of increase of 7.2 percent to the year 2020.

Hof and Kaiser (1983a, 1983b) did not project wilderness use itself, but included several activities that probably parallel wilderness use, particularly dispersed primitive camping. Their approach involved estimating per capita participation using a number of socioeconomic and supply variables in a regression model, and applying the equation using high, medium, and low projected values for the independent variables. Primitive camping was projected to increase from a 1977 base of 100 to 155, 205, or 311 by 2030 in the low, medium, and high scenarios. These indices translate to annual average rates of growth of less than 1 percent to a little over 2 percent.

A very different sort of time frame was used by Oliveira and others (1983) to project wilderness use a few days into the future (by projecting arrivals and departures). This was intended to determine available unused capacity for which permits could be issued in areas with use control Programs.

It is clear that knowledge of wilderness use projections is very limited. About all the handful of studies agree on is an increase in future use, but at widely varying rates. None suggest the slowing or declines that have appeared in recent years.

## ADOPTION OF RESEARCH BY MANAGERS

### Successes

Many wilderness management plans for areas where use and users have been studied have applied these research data. Estimates of the amount and type of use have been used to evaluate "people pressure" and determine the need to modify or limit use. The same types of data have been used to decide on the need for developments, such as horse loading ramps or outhouses, at specific trailheads. Trail plans have used data on use distribution to set appropriate maintenance standards evaluate possible changes in the trail network, and judge the potential for conflict between different types of use. Plans for areas that have not been studied have also been affected in general ways by improved knowledge of the typical characteristics of use and users.

The Limits of Acceptable Change (LAC) system has been developed to manage wilderness recreational carrying capacity (Stankey and others 1985; Lucas 1986). In the initial application of the LAC system to the Bob Marshall Wilderness complex in Montana, use pattern data were used to help define wilderness opportunity zones. Use data were applied in a similar way in the Maroon Bells-Snowmass Wilderness in Colorado. Use data were also employed as input to wilderness use simulation models to help establish encounter standards and select locations for monitoring encounters in the Maroon Bells-Snowmass Wilderness and the Desolation Wilderness (Shechter and Lucas 1978).

Information on amount of use and use distribution has generally shown that even the most heavily used wildernesses are lightly used during many times and in many places. Managers in some areas, such as Linville Gorge, have responded to this information by dropping overall area use limits, and instead have adopted weekend limits

at high use times and an informational program to teach low-impact behavior.

Efforts in some areas to disperse or redistribute use have applied data showing existing uneven, concentrated use patterns to try to redistribute use and plan specific efforts. Sometimes the data on use patterns have been directly provided to visitors (Lime and Lucas 1977; Lucas 1981; Roggenbuck and Berrier 1982). Use pattern data have been applied to deciding when and where to station persons to make educational contacts. Data on visitors' home locations and membership in conservation and outdoor clubs have been used to choose target areas and audiences for education efforts. Finally, the high education levels of wilderness users have encouraged managers to turn to informational contacts to teach minimum-impact use practices.

Some regulations have drawn partly on use/user data. Limits on party size are the main example. Limits have been justified mainly from studies of social and ecological impact; and in the early 1970's some areas established limits at 12 to 15 persons per group. Use data have since shown that there are relatively few parties of this size, so relatively few users are affected. More recently, such party size regulations have not been adopted, not because large groups are now condoned, but because the restrictions are no longer necessary; there have been reductions in the size of visitor groups.

Basic use and user data have been essential for the relatively few trend and projection studies, which are potentially useful to management.

The basic trail register system, widely used, especially by the Forest Service, was developed by research (Wenger 1964).

### Missed Opportunities

In general, available research results of use and user characteristics have been applied well by policymakers and managers. There are **some** cases, however, where application has lagged. Most notable among these are wilderness use estimation technology, implications of the large number of day-users of wilderness, access and trail routing, wilderness travel simulation technology, comprehensive application of information and education programs, and a comprehensive financial support program for professional wilderness management.

Although the development of wilderness use estimation methods has not been completed, available knowledge is not being used fully. Research has shown that location of trail use registration stations some distance up the trail produces much better response from visitors (Lucas and Kovalicky 1981; Petersen 1985), but trailhead locations continue to predominate, mainly because of convenience and associated lower costs. The necessity of determining registration rates to estimate use is obvious, but it seldom is actually done by managers. Cost is the major hindrance, although photographic monitoring equipment, which research helped develop, reduces costs considerably.

One of the most surprising and pervasive findings of use and user research is the large number of day-users in wilderness. These individuals seldom penetrate to the wilderness core and likely have relatively light ecological

impacts. They do, however, cause congestion along the periphery and outer zones of wildernesses, and they may be neither seeking nor receiving wilderness-dependent experiences. If this is the case, managers might reduce wilderness impacts by developing additional day-hiking opportunities in areas outside wilderness and informing hikers of these opportunities. In some cases such opportunities already exist, and all that is needed is a better information system. Some managers, such as in Shining Rock Wilderness in North Carolina, have already adopted such a strategy, but the potential for more extensive use exists.

The distribution of use among access points and along trails is very uneven in many areas. At the same time, use is largely confined to trails. Access points and trail routes thus become powerful management tools. By altering trail system configuration (such as closing some trails, adding loop trails, or branching trails from major trail trunks) and improving or failing to maintain access routes, managers can largely influence how many people use various zones of wilderness. Again, this strategy has been used by management, but not as extensively as it might be.

As has already been noted, many wilderness managers, such as those in Eagle Cap Wilderness, OR, and Shining Rock Wilderness, NC, have recognized the high education levels of wilderness users and have implemented informational programs to disperse use or teach low-impact practices. However, few areas, even the Boundary Waters Canoe Area or Yellowstone National Park where successful pilot programs to redistribute use through information have been tested (Lime and Lucas 1977; Krumpe and Brown 1982), have continued these programs. Research suggests that success of such programs depends on the source of the information, amount of information given, the timing of message transfer, the channel used to communicate the information, actually getting the message to the target audience, and characteristics of the audience and the situation (Roggenbuck and Watson 1986). Available knowledge of such wilderness use and user characteristics as education levels, use patterns, activities, behavior, background experience, and knowledge could be used to better tailor messages to audiences. This tailoring process admittedly must be subtle, perhaps as much art as science.

Limited budgets are almost certainly the most frequent reason for any lags in the adoption of management programs suggested by use and user data. Developing a soundly funded program to manage wilderness is probably the biggest challenge of the next decade. A partial solution to the dilemma may be found in data on wilderness user characteristics. Wilderness users as a group have above-average incomes. Most could afford a modest wilderness use fee.

## **RESEARCH ISSUES AND FUTURE DIRECTIONS**

### **Use Measurement Technology**

It is apparent that many types of wilderness research are hampered by the poor quality of recreation use esti-

mates. Projection and trend studies suffer severely, as has been pointed out, but so does research on impacts to the environment. Poor use data hinder skillful, professional management as well. Thus, we conclude that development of improved use measurement technology is still an important need.

Accurate techniques are available; the problem is lack of a cost-effective, accurate technique. Years ago, the scientists who did the most research on this topic (James and Schreuder 1971) said, "The authors believe that a satisfactory procedure is near at hand." That statement was probably true then and, unfortunately, it is still true almost 15 years later. The concerted research effort to close the gap never occurred.

Wilderness use measurement technology is not easy to develop, or it would have been done before now. However, it is a relatively "solvable" problem. If adequate resources were devoted to it for a reasonable time period, perhaps 5 years or so, the probability of solution would be high, probably higher than for almost any other significant problem (Shafer and Lucas 1979).

### **Coverage of Use/User Studies**

Visitor surveys have been the most common approach to studies of wilderness use and users. They have become less common in recent years. We welcome the emphasis on research on relationships and processes, but there is also a need for careful descriptive research. The results are directly useful to managers and planners, and also help researchers in selecting appropriate study areas, designing sampling plans, and extending results to other similar situations. Repeat descriptions can yield cross-sectional trend analyses.

We feel that more site-specific comprehensive visitor surveys are needed. The National River Recreation Survey (Knopf and Lime 1984) could be a model. Standardized instruments are used on a wide variety of rivers, distributed fairly evenly across the country and managing agencies, with rigorous sampling plans.

Wilderness use and users are almost undescribed in some regions of the country—the Southwest, for example—and they have been described in only a few wildernesses in many areas, including California, which has more reported wilderness use than any other State. Except for the Boundary Waters Canoe Area Wilderness, wildernesses in the Midwest and South-Central regions are unstudied.

Some types of use have been little studied anywhere. Most wilderness surveys have concentrated on the main summer use season. Hunters and other fall visitors have been included in only a few studies, and none have focused on them. Winter snow-season use has been little studied. (The only winter use studies we found are by Gilbert [1980], Taylor and Mackoy [1980], Taylor and Spencer [1980], and Hammitt and Hughes [1984].)

Data for many areas that have been studied are over 20 years old. In the meantime, use has more than doubled, the environmental movement arose and peaked, and a new generation of people has become wilderness visitors. The validity for the mid-1980's of visitor profiles from surveys done in the 1960's is a major question.

## Trends

More knowledge of trends in wilderness use and users is imperative for effective management. In fact, one of the main uses for improved recreational use measurement is identification of trends.

Similarly, user surveys, although useful in their own right, become much more valuable when trend information from repeat surveys or other sources is available to aid in interpretation. **Managers** can better evaluate a potential problem situation if, in addition to information on the current situation, they know if the particular case is improving, deteriorating, or stable. If groups are becoming smaller, for example, as they seem to be in many places, the need to institute party size limits is reduced. If visitors' reports of campsite solitude show fewer contacts with other campers, the need for additional actions by managers is far less than if the trend is toward higher contact levels, even though the current level of contacts is identical in both cases.

Stable or declining use suggests a need to reexamine some use controls. Most controls were instituted in a time of rapid growth and anticipated future growth. Managers were often trying to nip problems in the bud as much or more than solving existing problems. Some use rationing, and assigning of campsites, might be **relaxed if use is dropping**. For example, some National Parks with stringent visitor controls now report only half as much use as 8 or 10 years ago.

In addition to multiple cross-sectional survey data, other longitudinal approaches are needed. Following the changes in wilderness user behavior and experiences (and responses, attitudes, and preferences) of a sample of individuals over time, in a panel study, would tell us things about the dynamics of change that are only hinted at in multiple cross-section surveys. In particular, succession-displacement can only be studied with longitudinal research designs. This approach, effectively used by LaPage and Ragain (1971) in research on developed camping, can enrich our understanding of the processes of change. This approach would be especially useful for understanding the recent declines in use, and might suggest if the future is likely to feature declines, stability, or renewed growth.

## Privacy, Consideration

Concern for the subjects of visitor research must be kept high. Wilderness visitors have been marvelously cooperative with researchers. They answer questions with sincerity and friendliness, and exceptions are so rare as to be notable. In 25 years of wilderness visitor research, one of us (Lucas) has encountered only two visitors who declined to provide information, and one of them was almost surely an unlicensed, illegal outfitter who, understandably, wanted to keep a low profile.

Further evidence of the good will of wilderness visitors is the extremely high rates of return of mail questionnaires, generally in the 80-percent and even 90-percent range. Wilderness visitors truly must be one of the very best special populations for social science research.

Beyond legal questions, particularly for photographic observation techniques, researchers owe these visitors all

the consideration and sensitivity possible. Imposing on visitors' good will and interfering with an experience that is very important to most of them must be minimized. For example, interviews at campsites interrupt visitors (although researchers who have used this technique report they sensed little resentment) (Roberts this volume), and only a few types of studies with objectives that require data on visitor evaluations of specific, onsite conditions are appropriately approached onsite. Guarantees of confidentiality and anonymity must be strictly observed. Overstated promises are unethical.

Cameras used for observation are a powerful new tool with the potential for abuse. Their use must meticulously follow legal guidelines, but also be sensitive to people's concerns. A trail register is essentially a public place: a campsite or a wilderness swimming hole is not, and photographic observation should be limited to public places. It seems like a desirable courtesy to attach a small, simple sign to cameras and trail traffic counters explaining briefly what they are and what their purpose is, and including a phone number. This would ease curiosity or puzzlement by the few visitors who do detect equipment. Leatherberry and Lime (1981) did this, as did Petersen in her 1985 study.

## Sampling Approaches

Visitor studies must be based on rigorous, scientifically valid sampling systems. Convenience samples, with undefined probabilities for sampling elements (individuals or groups), undefined populations, and unspecified sampling frames are not justified now, if they ever were. Enough is known about the difficult sampling situation to design valid approaches. Costs may be higher and, as a **result**, samples may be smaller, but, in social science, a large sample never can compensate for poor sample quality. Most field samples are cluster samples, and this needs to be recognized. Pretending a cluster sample is a simple random sample is common, but it almost always results in overestimates of the precision of estimates—in other words, calculated confidence intervals are misleadingly **narrow**.

## Restrictions on Survey Research

Asking people for information about their use of wilderness and about themselves needs to be done with care. As discussed above, most wilderness visitors are very cooperative and welcome the chance to tell researchers about something that is near and dear to their hearts. However, asking poorly worded questions, gathering data not related to important study objectives, or gathering information with an inadequate sampling plan can result in a waste of respondents' time and effort. Very poor questions can even be embarrassing.

Therefore, review and control procedures are justified. Universities have committees for the protection of human subjects that review and approve proposed studies in social science, psychology, and medicine. Researchers who are Federal employees, or who are supported by Federal agencies, must obtain approval from the Office of Management and Budget (OMB) for any collection of information

from 10 or more people. This requirement began with the Federal Reports Act back in the 1940's, and was made more stringent in the 1980 Paperwork Reduction Act. The major concern motivating the legislation was the heavy burden imposed on businesses and local governments to provide information for regulatory and taxation purposes or to qualify for some benefit such as cost-sharing. Horror stories abound of several agencies independently asking for similar information, one this month, another next month, but in sufficiently different ways that the same answers could not be used for all of the forms. Claims were common that information was requested that the agency did not really need or use. Companies claimed they had to hire extra accountants to fill out complex forms, which they were almost always legally required to do.

It is a long step from legally required business forms affecting numerous firms to small-scale, voluntary surveys of wilderness visitors. The common OMB term "respondent burden" hardly seems applicable to the wilderness visitors who are almost always willing and often eager to answer questions.

The problem is not the need for a review and approval process. We agree this is necessary for quality control to protect the public, the taxpayers, and also responsible, qualified scientists from poorly done survey research. The difficulty is the time required and the uncertainty of the process. To obtain approval, study planning now needs to start about 18 months before fieldwork is to begin. Scientists should submit the questionnaire, study plan, and extensive, detailed question-by-question justification at least 6 months before data gathering is planned to start. This submission is handicapped, how severely is unclear, if the study has not previously been included in the annual "Information Collection Budget," which requires preplanning almost a year before actually seeking OMB approval, and thus results in the total lead time of about 18 months cited above. Approval generally is perceived as a somewhat chancy "win some-lose some" proposition, although scientists have usually eventually received approval.

The effects of this slow, cumbersome approach are several: (1) a lot of work for someone at OMB, with little significant public benefit (2) inability of researchers to respond quickly to emerging problems, managers' concerns, new scientific concepts, or follow up promptly on results of earlier studies; and (3) less chance for the public to express its desires and concerns. No other type of natural resource research must face delays such as those imposed by this formidable barrier. The result is that less wilderness visitor research is done. Some studies have been designed to use research techniques other than questionnaires to avoid the lengthy struggle, even though the study might have been strengthened if survey research methods had been included. We suspect some problems have been chosen for research because they could be studied without needing OMB approval for questionnaires.

Wilderness managers who might want to monitor key elements of visitor use to implement plans, judge their effectiveness, and guide their modification are stymied if they follow the law strictly. Monitoring levels of solitude, visitor conflicts, or visitor evaluations of changing recreational impacts has generally required specific approval for time and place of use of questionnaires, and busy man-

agers have not had the time and energy to seek approval for monitoring that could not begin until the next year or, more likely, the year after next. Without systematic monitoring, they must make do with hunches and impressions. There are too few researchers to be able to do the monitoring for them (and researchers have other duties), and many managers have felt unable to do the monitoring themselves.

It would seem to be in everyone's interest (OMB officials, researchers, wilderness managers, the public, and taxpayers) if a simpler, quicker review process could be developed. One possibility might be limited delegation of authority from OMB to Federal agencies doing wilderness visitor research. In the Forest Service research branch, for example, the typical recreation and wilderness research scientist has a Ph.D. with social science training and 15 to 20 years of experience in research. Perhaps several of these scientists could be assigned the duty of serving as a peer review board for studies proposed by Forest Service scientists and their university cooperators.

This would require OMB delegation, which could be limited to voluntary interviews or questionnaires involving less than 1,000 respondents. Similar limited approval for wilderness monitoring by managers could be arranged. The risks from such an arrangement seem minimal and the potential benefits great.

### **Household Survey Need**

Most research on wilderness use and users has been carried out onsite, with current visitors to a particular wilderness. Very few studies have involved the general public, or household studies. One reason is that, for all the difficulties of onsite sampling, general population studies focused on wilderness use are probably even more difficult, because wilderness users are a minority in most populations.

Nevertheless, many types of important questions cannot be answered just by onsite studies. Former visitors who have stopped coming to an area will be omitted, of course, and their reasons will remain unknown. Changing health, declining interest, or dissatisfaction with area conditions or with management actions may be involved, but we will never know if we rely on onsite surveys. This seems critical to explaining the surprising recent declines in use. What substitutes, if any, former visitors have found will not be known, either. Some of these questions could be addressed with longitudinal studies as well as general population surveys.

Similarly, potential visitors and the reasons that have kept them from becoming active visitors cannot be studied onsite, nor with longitudinal studies. Only general population surveys will reach this subpopulation. Other subjects, such as wilderness values and benefits to nonvisitors, can also only be studied in this way.

### **User Knowledge Research**

There is a great need for wilderness use and user research to focus on visitors' knowledge of low-impact wilderness practices. Agreement must be reached through empirical research on what the ideal minimum-impact

behaviors are. For example, some wilderness areas now recommend use dispersal to minimize impacts: others recommend use concentration. Some leave all firerings, some destroy most but leave one at each campsite, and some destroy all. Different methods are recommended to adequately dispose of human wastes. Once acceptable practices are selected, procedures must be developed to teach and measure knowledge of these practices. More information is needed on the relationship between knowledge of low-impact practices and actual behavior in wilderness. Finally, high-impact wilderness user groups must be identified, and reasons for their impacting behavior determined. We need to know if their impacts can be reduced through educational efforts, or if their impacts are the inevitable result of intrinsic use and user characteristics.

## **SUMMARY OF WILDERNESS USE AND USER RESEARCH**

Any summary of wilderness use and users, trends, and projections must be prefaced by an acknowledgment of the lack of sufficient and system-wide research. Most wilderness use and user research has occurred in the Rockies and the Boundary Waters Canoe Area, with limited additional work in California, New England, and the Southeast. The Southwest, the Deep South, the Midwest except for the Boundary Waters Canoe Area, and even California have been little studied. In addition, most research has been conducted in mountainous and alpine wildernesses. As the Wilderness System has become more diversified to include a range of ecosystems, there is a need to study wilderness use and users in desert, swamp, and coastal plain wildernesses. Also, past research on use and users has focused primarily on National Forest wilderness, with limited coverage of National Park areas. There have been virtually no published studies on Fish and Wildlife Service and Bureau of Land Management-managed wilderness. Most research has only covered the summer and some times the fall season. We know little about spring and winter users, except that winter use is reported to be rising in many places. There is a critical need for more research because limited work suggests that wilderness use and users may differ more across seasons of the year than across time, areas, or regions (Hughes 1985). Finally, there have been almost no followup studies of the same areas across years. Such longitudinal studies are needed to determine trends and projections and understand causal factors.

While acknowledging that additional research to reduce knowledge gaps may provide more insights, we are struck by the similarities of wilderness use and especially users across areas, regions, and even year of study. Similarities are much more pronounced than differences. Indeed, the profile of wilderness users is much clearer than it is for other recreationists (Hendee and others 1978).

### **User Characteristics**

There is a moderate over-representation of young adults among wilderness users. Under-35-year-olds are the most common. However, the 36-45 age group is also over-represented in most areas, and both children and older

adults visit wilderness in substantial numbers. Limited research suggests that the age structure of users is not changing through time.

Males are the big majority among wilderness users, usually from 65 to 85 percent of all visitors. Horse users are more typically male; hikers somewhat more likely to be female. Trends suggest an increasing use of wilderness by females. Wilderness is certainly not the absolute domain of men.

The most distinguishing feature of wilderness users is their high education. Everywhere wilderness users have much higher education than the general population for the States where they reside. For most areas, the percentage of wilderness users who have attended or are attending graduate school is larger than the percentage of the U.S. population that goes to college. Recent studies also show that education levels of wilderness visitors are even higher now than in the past.

Apparently there is more variation in the occupations of wilderness users across areas than for most other user characteristics. Generally, most users are professional and technical workers, followed by students. Housewives and clerical, sales, and service workers are the most under-represented. Exceptions to this profile are large, western, horse-oriented wildernesses and scattered areas where local, rural users are common. Farmers, ranchers, and blue collar workers are more prevalent in these areas. Still, the typical user is a professional, and trends suggest that this will be even more the case in the future.

As a group, wilderness users have somewhat above average incomes. For most areas, however, wilderness visitors could not be classified as wealthy. Most eastern area and California users have incomes well above the national average, but they appear to reflect the generally higher incomes of the residents of these States. The users of a few areas with considerable horse and outfitting use or airplane access apparently do have unusually high incomes. Research indicates that high incomes are not needed to enjoy most wildernesses. The typical visitor resides near the wilderness area, and costs per day to use and enjoy wildernesses are low.

Typically most wilderness users reside in the State where the area is located, and indeed most come from the region of the State that includes the wilderness. Thus, from the standpoint of recreation, most areas have a local or regional clientele. Wilderness areas in the East appear to diverge somewhat from this tendency. There, more visitors are from out of State. This likely reflects the small size of many eastern States, the scarcity of wilderness resources, and the high demand for wilderness experiences.

Most wilderness visitors are urban, but so, too, is the U.S. population. In many areas the proportion of urban to rural visitors is about equal to the proportion found in the State where the wilderness is located. This suggests that the overrepresentation of urbanites in wilderness may not be as great as some have suggested. In many areas the urban users had a predominantly rural upbringing, but this tendency was less strong among eastern area users. The proportion of urban to rural residents within wilderness appears quite stable for those few areas that have been studied in both the 1970's and 1980's.

Membership in wilderness, conservation, and outdoor clubs is generally low among wilderness users, usually below 35 percent. Exceptions appear to be some eastern areas with a highly urban clientele. Different kinds of users often belong to different types of organizations. Hunters and horse users more often join local clubs such as rod and gun clubs, while hikers have a tendency to belong to larger national conservation organizations.

Most wilderness users have considerable previous experience in wilderness. For most areas, 60 to 90 percent of the users have previously been to wilderness or backcountry areas, and about half have been to the study area before. Limited evidence suggests that visitors to recently established areas have less previous experience in the area. This suggests that wilderness designation does attract new clientele. Also, most wilderness users make multiple visits to wildernesses each year.

The most common group type in wilderness is the family—either the family alone or the family with friends. Such groups generally make up the majority of all groups, and limited research suggests their numbers are increasing. Groups of friends are typically the second most numerous. Organized groups such as Scouts or church groups usually comprise fewer than 10 percent of all parties.

## Use Patterns

Distribution of wilderness use is very uneven through time, across areas, and within areas. Weekend peaking of use is severe, especially in western wilderness areas close to population centers. Peaking seems even more prevalent among winter wilderness users. On the other hand, the weekly pattern of use seems more evenly distributed among eastern areas, and recent studies show less weekend peaking than did earlier research.

Summer is the high season of use most places, but the ratio of summer to off-season use varies a great deal by area. Some areas have peaks of use of short duration during the fall hunting season, and October is a high-use month because of fall color in some eastern areas. Spring is a high-use time in a few low-elevation areas in the Southwest and southern California. Finally, while winter is typically a very low use period, use during this time appears to be increasing.

Use is also extremely variable among the many areas of the Wilderness System. A few areas often account for a third or more of an entire agency's wilderness visitation. Those near major population centers, such as those in the southern Appalachians, New England, Minnesota, and California, are typically the most heavily used, but location does not explain all the variation. Some swampy wildernesses in the Southeast are lightly used, and several of the recently established eastern areas have little use. Such absence of use may be due to the lack of special attractions, absence of trail or travel routes, or lack of knowledge of the areas.

Use is also concentrated at a few entry points almost everywhere. Typically about a third of an area's trailheads account for about 80 percent of all use. Winter use appears even more concentrated, but summer use of eastern areas appears somewhat less concentrated. Some evidence

suggests that dispersal of summer use to more trailheads is currently taking place. Cross-country travel—travel for considerable distances off trails—is low everywhere, but lower in the Northern Rockies than in mountain areas in California. Use of trails within areas is highly variable, and appears to be affected by trailhead location relative to population centers, ease of road access to the trailhead, trail system configuration, distance from the trailhead to the wilderness, and location of area attractions. Campsites tend to be located near water, and while campsite use is very uneven, it tends to be less so than use of trail segments.

Party size is small, averaging about four individuals in National Forest areas and two to three persons in National Park areas. Lone individuals are rare everywhere, but are about twice as common in National Park backcountry (10 to 15 percent of all groups) as in National Forest wilderness (where they typically make up from 5 to 10 percent). Parties of 10 or more accounted for 5 to 10 percent of use almost everywhere. Also, group size appears to be getting smaller through time.

Hiking is the primary method of travel everywhere except for such water areas as the Boundary Waters Canoe Area and for a few horse-oriented areas such as the Bob Marshall. There is almost no horse use in eastern wilderness areas; and even in western areas, the trend is away from horse use and toward backpacking use. Indeed, the biggest change that Lucas (1985b) found between the 1970 and 1982 use patterns among three western wilderness areas was a shift in proportions of total use away from horse use and toward hiking.

Correlated with the decline in the proportion of wilderness visitors who use horses is the general decline in the proportion of visitors who employ outfitters. Most areas studied have less than 1 percent of their visits outfitted, only the Bob Marshall and the Great Bear Wildernesses have sizable numbers of outfitted parties, but the Bob Marshall Wilderness complex dropped from 35 percent outfitted groups to 17 percent from 1970 to 1982. Outfitting levels are quite high on some wilderness whitewater rivers, and also for a few large western wildernesses during the fall hunting season.

Length of stay of wilderness trips is short and getting shorter. Most areas have average lengths of stay of about 2 to 3 days. Exceptions are longer trips in the BWCA, the Bob Marshall, the Great Bear, and summer users in the backcountry of the Great Smoky Mountains National Park. In some areas 50 percent of all use is day-use, but this is highly variable. Trips of a week or more are rare everywhere, and distance traveled in wilderness is typically short. Horse trips tend to be longer than hiking trips. Winter use is generally shorter in time and distance than summer use, and length of stay is highly variable among eastern areas.

Finally, most wilderness users engage in multiple activities in wilderness. Generally, hiking, fishing, and photography are the most frequent activities. Following these in importance are nature study and swimming. Certain wilderness activity packages are common to different wilderness areas. The most common activity package includes hiking, fishing, swimming, and nature study, but low hunting and horse use. Desolation Wilderness is a

prototype of this wilderness type. At the other extreme are areas such as the Bob Marshall and the Great Bear that have high horse use, hunting, and photography, but low hiking, nature study, and swimming. Limited trend data suggest that such consumptive uses of wilderness as hunting and fishing are declining in proportion to total use; the more contemplative activities are increasing.

## Trends

The small amount of research on trends provides little thoroughly supported knowledge. The effect of regional differences and variations among individual wildernesses may confound trends over time, and there are not enough studies of different types of wildernesses to disentangle geographical and temporal effects. However, some similar results have emerged that can be cautiously considered as relatively well supported.

First, the rate of increase of wilderness recreation use seems to be slowing down. There are indications that use may be leveling off, and maybe even dropping. In several places, National Park backcountry use seems to have peaked in the mid-1970's (van Wagtenonk and Benedict 1980), and National Forest wilderness use appears to have possibly peaked in the early 1980's (table 1).

The "designation effect"-the idea that labeling an area as wilderness stimulates use markedly-is often mentioned, but its significance is an unsettled issue. There is some evidence for such an effect, although probably not as strong as some might expect (Petersen 1981), and other evidence that the effect is certainly not inevitable (McCool 1985). Perhaps the force of designation is diluted because the number of wildernesses has grown so large-over 450-and so many new areas have been added recently -162 new National Forest wildernesses in 1984 alone, as well as other new wildernesses in the other wilderness-managing agencies. Any new area is likely to be publicized less and compete for visitation with more areas than was the case earlier.

A number of trends in the characteristics of wilderness use and users have been reported in most of the few trend studies. Use seems to be spreading out more (Lucas 1967, 1985b; van Wagtenonk 1981); stays most places are becoming shorter (Lucas 1967, 1985b; Cieslinski 1980) but were unchanged in Great Smoky Mountains National Park (Burde and Curran 1986). More visitors are coming from farther away (Lucas 1964b, 1985b); parties are becoming smaller (Cieslinski 1980; Corti and others 1982; Lucas 1985b; Burde and Curran 1986); fewer visitors have been to the study wilderness before (Corti and others 1982; Lucas 1985b); and there are more women visitors (van Wagtenonk 1981; Lucas 1985b). There are few major conflicts in results from these few studies, although most of the characteristics reported on are not included in more than one or two of the studies, making comparisons difficult.

The number of projection studies is too small to draw conclusions about agreement or disagreement regarding level of projected use. A variety of approaches have been used, and it is not clear that a final answer on the best method has been found. The two earliest projections agreed very closely with one another, probably due to

lucky accident. These projections were a little high to 1976, but not bad considering the difficulties involved. The later studies project widely varying annual average rates of growth, from less than 1 percent (Hof and Kaiser 1983a, 1983b) (in their low scenario using figures for primitive, dispersed camping, hiking/backpacking, and horseback riding), to over 7 percent (Jungst and Countryman 1982). These rates of growth have vastly different results over time; in 40 years a 1-percent-per-year rate results in a 49-percent increase, while a 7-percent rate leads to 1,400-percent growth! There is no consensus on the magnitude of projections of wilderness recreation. Projections are unlikely to improve until use estimates are improved, research increases our understanding of the factors related to changes in use, and better projections of these factors become available.

## REFERENCES

- Boteler, F. E. Eastern and western wildland users: a comparison of their characteristics with implications for management decision making. In: Proceedings of the conference on social research in National Parks and wildland areas; 1980 March 21-22; Gatlinburg, TN. Atlanta, GA: U.S. Department of the Interior, National Park Service, Southeast Regional Office; 1981: 99-106.
- Bratton, Susan Power; Hickler, Matthew G.;
- Graver, James H. Trail and campsite erosion survey for Great Smoky Mountains National Park. Part II: Patterns of overnight backcountry use and conditions of camp sites. Management Report 16. Gatlinburg, TN: U.S. Department of the Interior, Great Smoky Mountains National Park, Uplands Field Research Laboratory; 1977. 126 p.
- Brown, Perry J. Information needs for river recreation planning and management. In: Proceedings, river recreation management and research symposium; 1977 January 24-27; Minneapolis, MN. General Technical Report NC-28. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1977: 193-201.
- Brown, Perry J.; Haas, Glenn E. Relationships between resource attributes and psychological preferences of outdoor recreationists. Progress report submitted to U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO: Colorado State University, College of Forestry and Natural Resources; 1978. 19 p.
- Brown, Perry J.; Haas, Glenn E.; Manfredo, Michael J. Identifying resource attributes providing opportunities for dispersed recreation. Final report submitted to U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station and Region 2. Fort Collins, CO: Colorado State University, College of Forestry and Natural Resources; 1977. 55 p.
- Brown, Perry J.; Schomaker, John H. Criteria for potential wilderness campsites: final report submitted to the Intermountain Forest and Range Experiment Station. Supplement No. 32 to 12-11-204-3. Logan, UT: Utah State University, Institute for Study of Outdoor Recreation and Tourism; 1974. 50 p.

- Bultena, Gordon L.; Taves, Marvin J. Changing wilderness images and forestry policy. *Journal of Forestry*. 59(3): 167-171; 1961.
- Burch, William R. Wilderness-the life cycle and forest recreational choice. *Journal of Forestry*. 64(9): 606.610; 1966.
- Burch, William R.; Wenger, Wiley D. The social characteristics of participants in three styles of family camping. Research Paper PNW-48. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1967. 30 p.
- Burde, J. H.; Curran, K. A. User perception of backcountry management policies at Great Smoky Mountains National Park. In: Kulhavy, David L.; Conner, Richard N., eds. *Wilderness and natural areas in the eastern United States: a management challenge*; 1985 May 13-16; Nacogdoches, TX Nacogdoches, TX Stephen F. Austin University; 1986: 223-228.
- Bureau of Outdoor Recreation. The 1970 survey of outdoor recreation activities: preliminary report. Washington, DC: U.S. Government Printing Office; 1972. 105 p.
- Ciali, C. P.; Leonard, R. E.; Lindsay, J. J. Collecting hiker information in the backcountry: a methodological study. Recreation Management Program Research Report SNR-RM4. Burlington, VT: University of Vermont; 1978. 13 p.
- Cieslinski, Thomas J. Trends in Allagash Wilderness Waterway uses. In: *Proceedings, 1980 national outdoor recreation trends symposium*; 1980 April 20-23; Durham, NH. General Technical Report NE-57, Vol. II. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1980: 147-149.
- Clark, Roger N.; Johnson, Darryll R.; Field, Donald R. The Alaska public survey-a comprehensive assessment of recreational values and use patterns and natural resource management. In: Lime, David W., coord. *Forest and river recreation: research update: selected papers presented at the symposium on leisure research, National Recreation and Park Association*; 1981 October 25-27; Minneapolis, MN. Miscellaneous Publication 18. St. Paul, MN: University of Minnesota Agricultural Experiment Station; 1982: 115-119.
- Cole, David N. Wilderness campsite impacts: effects of amount of use. Research Paper INT-284. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1982. 34 p.
- Cole, David N. Campsite conditions in the Bob Marshall Wilderness, Montana. Research Paper INT-312. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1983. 19 p.
- Corti, Adrienne; Petersen, Margaret E.; McCool, Stephen F. Trends in recreational use of the Rattlesnake National Recreation Area and Wilderness: a test of the designation hypothesis. A report submitted to the Wilderness Management Research Unit, Intermountain Forest and Range Experiment Station. Missoula, MT: University of Montana, 1982. 16 p.
- Cushwa, Charles T.; McGinnes, Burd S.; Ripley, Thomas H. Forest recreation: estimates and predictions in the North River area, George Washington National Forest, Virginia. Bulletin 558. Blacksburg, VA: Virginia Polytechnic Institute, Agricultural Experiment Station, Department of Forestry and Wildlife Resources; 1965. 48 p.
- DeLand, Loren F. Development of the Forest Service trail traffic counter. Test Report 7700-10. Missoula, MT: U.S. Department of Agriculture, Forest Service, Equipment Development Center; 1976. 19 p.
- Deutscher, J. What we say/what we do. Glenview, IL: Scott, Foresman and Co.; 1973. 370 p.
- Dodds, Earl F. [Letters and attached visitor use surveys to Robert C. Lucas]. 1977 February 11. 23 leaves; 1978 February 22. 34 leaves. Located at: U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Forestry Sciences Laboratory, Missoula, MT; RWU 4901 files.
- Driver, B. L.; Tocher, S. Ross. Toward a behavioral interpretation of recreational engagements, with implications for planning. In: Driver, B. L., ed. *Elements of outdoor recreation planning: Proceedings of a national short course*; 1968 May 6-16; Ann Arbor, MI. Ann Arbor, MI: University Microfilms; 1970: 9-31.
- Echelberger, Herbert E.; Moeller, George H. Use and users of the Cranberry backcountry in West Virginia: insights for eastern backcountry management. Research Paper NE-363. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1977. 8 p.
- Elsner, Gary H. Wilderness management. . . a computerized system for summarizing permit information. General Technical Report PSW-2. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station; 1972. 8 p.
- Field, Donald R. The telephone interview in leisure research. *Journal of Leisure Research*. 5(1): 51-59; 1973.
- Gasvoda, David. Installation and operation of the Canon 814-XL camera traffic classification system. USDA Forest Service Manual. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Equipment Development Center; 1978. 9 p.
- Gilbert, R. S. Dispersed winter recreation use in the Badger Pass backcountry of Yosemite National Park: challenges and opportunities. In: *Proceedings, North American symposium on dispersed winter recreation*; 1980 February 27-29; St. Paul, MN. Office of Special Programs-Educational Series 2-3. St. Paul, MN: University of Minnesota, Agricultural Extension Service; 1980: 114-117.
- Haas, Glenn E. Points of origins of the Indian Peak backcountry recreationists. Addendum to final report: Identifying resource attributes providing opportunities for dispersed recreation. Submitted to U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station and Region 2. Fort Collins, CO: Colorado State University, College of Forestry and Natural Resources; 1978a. 5 p.
- Haas, Glenn E. Quantification of preferences for dispersed outdoor recreation-Weminuche Wilderness phase. Progress Report. Weminuche Wilderness recreation use statistics. Fort Collins, CO: Colorado State University, Department of Recreation Resources; 1978b. 15 p.
- Haas, Glenn E. Use preferences for recreation experience opportunities and physical resource attributes in three

- Colorado wilderness areas. Fort Collins, CO: Colorado State University, Department of Recreation Resources; 1979. 141 p. Ph.D. dissertation.
- Haas, Glenn E.; Arnold, J. R.; Brown, Perry J.; Driver, B. L. Final report of research results for the cooperative management-research demonstration project focusing on the Maroon Bells-Snowmass Wilderness in Colorado. Submitted to U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO: Colorado State University, College of Forestry and Natural Resources; 1982. 93 p.
- Hammitt, W. E.; Hughes, J. L. characteristics of winter backcountry use in Great Smoky Mountains National Park. *Environmental Management*. 8(2): 161-166; 1984.
- Heberlein, Thomas A. Social psychological assumptions of user attitude surveys: the case of the wilderness scale. *Journal of Leisure Research*. 5(3): 18-33; 1973.
- Heberlein, Thomas A.; Dunwiddie, Peter. Systematic observation of use levels, campsite selection and visitor characteristics at a high mountain lake. *Journal of Leisure Research*. 11(4): 307-316; 1979.
- Helgath, Sheila F. Trail deterioration in the Selway-Bitterroot Wilderness. Research Note INT-193. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1975. 15 p.
- Hendee, John C.; Catton, William R, Jr.; Marlow, Larry D.; Brockman, C. Frank. Wilderness users in the Pacific Northwest: their characteristics, values and management preferences. Research Paper PNW-61. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1968. 92 p.
- Hendee, John C.; Clark, Roger N.; Dailey, Thomas E. Fishing and other recreation behavior at high mountain lakes in Washington State. Research Note PNW-304. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1977. 27 p.
- Hendee, John C.; Stankey, George H.; Lucas, Robert C. Wilderness management. Miscellaneous Publication No. 1365. Washington, DC: U.S. Department of Agriculture, Forest Service; 1978. 381 p.
- Hill, J. M. A comparative study of student awareness with United States Forest Service recommended methods of wilderness conduct. Salt Lake City, UT: University of Utah; 1975. (Pages unknown). MS. thesis.
- Hof, John G.; Kaiser, H. Fred. Long-term outdoor recreation participation projections for public land management agencies. *Journal of Leisure Research*. 15(1): 1-14; 1983a.
- Hof, John G.; Kaiser, H. Fred. Projections of future forest recreation use. Resource Bulletin WO-2. Washington, DC: U.S. Department of Agriculture, Forest Service; 1983b. 12 p.
- Hughes, J. L. Winter backcountry campers in the Great Smoky Mountains National Park their behavior, use patterns, and characteristics. Knoxville, TN: University of Tennessee; 1985. 116 p. M.S. thesis.
- Huppuch, Charles; Pellerin, Michael. Validation of trailside registration stations by volunteers: In: Proceedings, southeastern recreation research conference; 1984 February 16-17; Asheville, NC. Athens, GA: University of Georgia, Institute for Behavioral Research; 1984: 23-28.
- James, George A.; Schreuder, Hans T. Estimating use in the San Gorgonio Wilderness. *Journal of Forestry*. 69(8): 490-493; 1971.
- James, George A.; Schreuder, Hans T. Estimating dispersed recreation use along trails and in general undeveloped areas with electric-eye counters: preliminary findings. Research Note SE-181. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1972. 8 p.
- Jubenville, Alan. A test of difference between wilderness recreation party leaders and party members. *Journal of Leisure Research*. 3(2): 116-119; 1971.
- Jungst Steven E.; Countryman, David W. Two regression models for projecting future wilderness use. *Iowa State Journal of Research*. 57(1): 33-41; 1982.
- Keegan, Charles E.; Lenihan, Mary L.; Polzin, Paul E.; Wallwork, Susan Selig. The Montana poll: Montanans and wilderness issues. *Montana Business Quarterly*. 20(2): 4-14; 1982.
- Kennedy, James J.; Brown, Perry J. Attitudes and behavior of fishermen in Utah's Uinta Primitive Area. *Fisheries*. 1(6): 15-17, 30-31; 1976.
- Knopf, Richard C.; Lime, David W. A recreation manager's guide to understanding river use and users. General Technical Report WO-38. Washington, DC: U.S. Department of Agriculture, Forest Service; 1984. 37 p.
- Kraushaar, James; Parsons, David; Stohlgren, Thomas. Nature and extent of differences between actual and planned backcountry use in Sequoia and Kings Canyon National Parks. In: Abstracts, 2d conference on scientific research in the National Parks; 1979 November 26-30; San Francisco, CA. Washington, DC: U.S. Department of the Interior, National Park Service; 1979: 176. Abstract.
- Krumpe, E. E.; Brown, P. J. Redistributing backcountry use through information related to recreation experiences. *Journal of Forestry*. 80(6): 360-362, 364; 1982.
- LaPage, Wilbur F. Some observations on campground trampling and ground cover response. Research Paper NE-68. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1967. 11 p.
- LaPage, Wilbur F.; Ragain, Dale P. Trends in camping participation. Research Paper NE-183. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1971. 22 p.
- Leatherberry, Earl C.; Lime, David W. Unstaffed trail registration compliance in a backcountry area. Research Paper NC-214. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1981. 11 p.
- Lee, Robert G. The management of human components in the Yosemite National Park ecosystem. Yosemite, CA: The Yosemite Institute; 1975. 134 p.
- Leonard, R. E.; Echelberger, N. E.; Plumley, H. J.; van Meter, L. W. Management guidelines for monitoring use on backcountry trails. Research Paper NE-428. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1980. 20 p.

- Leonard, R. E.; Echelberger, H. E.; Schnitzer, M. Use characteristics of the Great Gulf Wilderness. Research Paper NE-428. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1978. 9 p.
- Lime, David W. Large groups in the Boundary Waters Canoe Area-their numbers, characteristics, and impact. Research Note NC-142. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1972. 4 p.
- Lime, David W. Sources of congestion and visitor dissatisfaction in the Boundary Waters Canoe Area. In: Proceedings, the Quetico-Superior Foundation 1975 Institute on the BWCA, 1975 May 9; Duluth, MN. Minneapolis, MN: Quetico-Superior Foundation; 1975: 68-82.
- Lime, David W.; Buchman, Roland G. Boundary Waters Canoe Area visitor use estimates: 1973 and 1974. Office Report. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1975. 77 p.
- Lime, David W.; Knopf, Richard C.; Peterson, George L. The national river recreation study: growing new data base with exciting potential In: Lime, David W.; Field, Donald R., tech. coords. Some recent products of river recreation research. General Technical Report NC-63. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1981: 1-8.
- Lime, David W.; Lorence, Grace A. Improving estimates of wilderness use from mandatory travel permits. Research Paper NC-101. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1974. 7 p.
- Lime, David W.; Lucas, Robert C. Good information improves the wilderness experience. *Naturalist* 28(4): 18-20; 1977.
- Lucas, Robert C. Bias in estimating recreationists' length of stay from sample interviews. *Journal of Forestry*. 61(12): 912-914; 1963.
- Lucas, Robert C. The recreational use of the Quetico-Superior area. Research Paper LS-8. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Lake States Forest Experiment Station; 1964a 50 p.
- Lucas, Robert C. Wilderness perception and use: the example of the Boundary Waters Canoe Area. *Natural Resources Journal*. 3(3): 394-411; 1964b.
- Lucas, Robert C. The changing recreational use of the Boundary Waters Canoe Area. Research Note NC-42. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1967. 4 p.
- Lucas, Robert C. Pilot test of traffic counter-movie camera equipment for measuring and classifying trail recreational use. Spanish Creek trail, Spanish Peaks Primitive Area, Montana. Data collected 1977 August. Located at: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Forestry Sciences Laboratory, Missoula, MT; RWU-4901 files.
- Lucas, Robert C. Low compliance rates at unmanned trail registers. Research Note INT-200. Ogden, UT: U.S. Department of Agriculture, Forest Service; Intermountain Forest and Range Experiment Station; 1975. 6 p.
- Lucas, Robert C. Use patterns and visitor characteristics, attitudes, and preferences in nine wilderness and other roadless areas. Research Paper INT-253. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1980. 89 p.
- Lucas, Robert C. Redistributing wilderness use through information supplied to visitors. Research Paper INT-277. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1981. 15 p.
- Lucas, Robert C. Recreation regulations-when are they needed? *Journal of Forestry*. 80(3): 148-151; 1982.
- Lucas, Robert C. Low and variable visitor compliance rates at voluntary trail registers. Research Note INT-326. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1983. 5 p.
- Lucas, Robert C. Recreational trend information and management of the Bob Marshall Wilderness complex. In: Proceedings, outdoor recreation trends symposium II; 1985 February 24-27; Myrtle Beach, SC. Clemson, SC: Clemson University; 1985a: 309-316.
- Lucas, Robert C. Visitor characteristics, attitudes, and use patterns in the Bob Marshall Wilderness complex, 1974-82. Research Paper INT-345. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station; 1985b. 32 p.
- Lucas, Robert C. Section 10. A wilderness planning application example. In: Lucas, Robert C., compiler. Proceedings-national wilderness research conference: current research; 1985 July 23-26; Fort Collins, CO. General Technical Report INT-212. Ogden, UT U.S. Department of Agriculture, Forest Service, Intermountain Research Station; 1986: 523-555.
- Lucas, Robert C.; Kovalicky, Thomas J. Self-issued wilderness permits as a use measurement system. Research Paper INT-270. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1981. 18 p.
- Lucas, Robert C.; Oltman, Jerry L. Survey sampling wilderness visitors. *Journal of Leisure Research*. 3(1): 28-43; 1971.
- Lucas, Robert C.; Schreuder, Hans T.; James, George A. Wilderness use estimation: a pilot test of sampling procedures on the Mission Mountains Primitive Area. Research Paper INT-109. Ogden, UT U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1971. 44 p.
- Lucas, Robert C.; Schweitzer, Dennis. Outdoor recreation surveys: length-of-stay bias and its correction by computer. Research Note LS-68. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Lake States Forest Experiment Station; 1965. 2 p.
- Manfredo, Michael J. Rawah and Comanche Big South use estimates. Fort Collins, CO: Colorado State University, Department of Recreation Resources; 1978a. 23 p. Unpublished report.
- Manfredo, Michael J. Recreation use estimates for the Fitzpatrick Wilderness, Popo Agie Primitive Area and surrounding backcountry, and the Bridger Wilderness. Unpublished report to U.S. Department of Agriculture,

- Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO: Colorado State University, Department of Recreation Resources; 1978b. 25 p.
- Manfredo, Michael J.; Haas, Glenn E. Eagles Nest Wilderness use estimates. Fort Collins, CO: Colorado State University, Department of Recreation Resources; 1978. 22 p. Unpublished report.
- Marion, Jeffrey L.; Merriam, L. C. Recreational impacts on well-established campsites in the Boundary Waters Canoe Area Wilderness. Station Bulletin AD-SB-2502. St. Paul, MN: University of Minnesota, Agricultural Experiment Station; 1985. 15 p.
- Marnell, Leo F. Methods for counting river recreation users. In: Proceedings: river recreation management and research symposium; 1977 January 24-27; Minneapolis, MN. General Technical Report NC-28. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1977: 77-82.
- Marnell, Leo; Foster, David; Chilman, Kenneth. River recreation research conducted at Ozark National Scenic River-ways 1970-1977: a summary of research projects and findings. Van Buren, MO: U.S. Department of the Interior, National Park Service; 1978. 139 p.
- McAvoy, Leo H.; Hamborg, Roland. Wilderness visitor knowledge of regulations: a comparison of visitor contact methods. *Journal of Interpretation*. 9(1): 1-10; 1984.
- McCool, Stephen F. Does wilderness designation lead to increased recreational use? *Journal of Forestry*. 83(1): 39-41; 1985.
- McCool, Stephen F.; Stankey, George H. Trends in visitor attitudes toward wilderness fire management policy. Research Paper INT-357. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station; 1986. 7 p.
- Merriam, L. C., Jr. A land use study of the Bob Marshall Wilderness Area of Montana. Bulletin 26. Missoula, MT: University of Montana, School of Forestry, Forest and Conservation Experiment Station; 1963. 190 p.
- Merriam, L. C., Jr.; Ammons, R. B. The wilderness user in three Montana areas. St. Paul, MN: University of Minnesota, School of Forestry; 1967. 54 p.
- Merriam, L. C., Jr.; Luding, Kay; Ammons, R. B. Glacier Park chalet visits: an introduction to wilderness experience. Research Note 2. Missoula, MT: Montana State University [now University of Montana], School of Forestry, Montana Forest and Conservation Experiment Station; 1965. 3 p.
- Mullins, William H. Sawtooth Wilderness visitor use study-1975. 1975. Unpublished paper on file at: U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Forestry Sciences Laboratory, Missoula, MT.
- Murray, Judith Buckley. Appalachian Trail users in the southern National Forests: their characteristics, attitudes, and management preferences. Research Paper SE-116. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1974. 19 p.
- Nielsen, Joyce McCarl; Shelby, Bo. River-running in the Grand Canyon: how much and what kind of use? In: Proceedings, river recreation management and research symposium; 1977 January 24-27; Minneapolis, MN. General Technical Report NC-28. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1977: 160-177.
- Oliveira, Ronald A.; Arthur, Louise; Papasravrou, Anastassios C. A distributed lag approach to forecasting wilderness use. *Journal of Leisure Research*. 15(1): 52-64; 1983.
- Outdoor Recreation Resources Review Commission [ORRRC]. Wilderness recreation-a report on resources, values and problems. Study Report No. 3. Washington, DC: U.S. Government Printing office; 1962. 352 p.
- Petersen, Margaret E. Trends in recreational use of National Forest wilderness. Research Note INT-319. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1981. 3 p.
- Petersen, Margaret E. Improving voluntary registration through location and design of trail registration stations. Research Paper INT-336. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1985. 8 p.
- Plumley, H. J.; Peet, H. T.; Leonard, R. E. Records of backcountry use can assist trail managers. Research Paper NE-414. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1978. 19 p.
- Purdy, Ken G.; Shaw, William W. An analysis of recreational use patterns in desert bighorn habitat: the Pusch Ridge Wilderness case. In: Desert Bighorn Council transactions. Tucson, AZ: University of Arizona, School of Natural Resources; 1981: 1-5.
- Reiling, S. D.; Montville, F. E.; Facchina, C. R. Baxter State Park a profile of users, activities, and user attitudes, 1979. Bulletin 776. Orono, ME: University of Maine, Life Sciences and Agricultural Experiment Station; 1981. 40 p.
- Robertson, Rachel Dawn. An investigation of visitor behavior in wilderness areas. Iowa City, IA: University of Iowa; 1981. 174 p. Ph.D. dissertation.
- Roggenbuck, J. W. Wilderness user preferences: eastern and western areas. In: Proceedings of the wilderness management symposium; 1980 November 13-15; Knoxville, TN. Knoxville, TN: University of Tennessee; 1980: 103-146.
- Roggenbuck, J. W.; Berrier, D. L. Communications to disperse wilderness campers. *Journal of Forestry*. 79(5): 245-297; 1981.
- Roggenbuck, J. W.; Watson, A. E. Providing information for management purposes. In: Kulhavy, David L.; Conner, Richard N., eds. Wilderness and natural areas in the eastern United States: a management challenge; 1985 May 13-16; Nacogdoches, TX. Nacogdoches, TX: Stephen F. Austin University; 1986: 236-242.
- Roggenbuck, Joseph W.; Berrier, Deborah L. A comparison of the effectiveness of two communication strategies in dispersing wilderness campers. *Journal of Leisure Research*. 14(1): 77-89; 1982.
- Roggenbuck, Joseph W.; Timm, Wendy N.; Watson, Alan E. Visitor perception of the recreation carrying capacity of three wilderness areas in North Carolina. Blacksburg, VA: Virginia Polytechnic Institute

- and State University, School of Forestry and wildlife Resources; 1979. 303 p.
- Saunders, Paul Richard. Monitoring and reporting recreation use: a case study. In: Southeastern recreation research conference, 1980-1981: Proceedings; 1980 February 18-19; 1981 February 19-20; Asheville, NC. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1982: 143-164.
- Schomaker, J. H. Effect of selected information on dispersal of wilderness recreationists. Fort Collins, CO: Colorado State University; 1975. 95 p. Ph.D. dissertation.
- Scotter, George W. Response rates at unmanned trail registers. *Journal of Leisure Research*. 13(2): 105-111; 1981.
- Shafer, Elwood L., Jr.; Lucas, Robert C. Research needs and priorities for dispersed recreation management. *Journal of Leisure Research*. 10(4): 311-320; 1979.
- Shaw, W. W.; Richards, M. T. Recreational and scientific activity in Cave Creek Canyon, Chiricahua Mountains, Arizona, 1978-79. Final report prepared for the Coronado National Forest, Forest Service, U.S. Department of Agriculture. Tucson, AZ: University of Arizona, School of Renewable Natural Resources; 1979. 22 p.
- Shechter, M. On the use of home site surveys in recreation research. In: Elsner, Gary H., compiler. *State-of-the-art methods for research, planning, and determining the benefits of outdoor recreation*. General Technical Report PSW-20. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station; 1977: 23-27.
- Shechter, Mordechai; Lucas, Robert C. *Simulation of recreational use for park management*. Baltimore: Johns Hopkins University Press; 1978. 220 p.
- Snowden, Michael R. *Winter recreation in the Adirondack High Peaks Wilderness: user characteristics, attitudes and perceptions*. Ithaca, NY: Cornell University; 1976. M.S. thesis.
- Stankey, George H. Visitor perception of wilderness recreation carrying capacity. Research Paper INT-142. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1973. 61 p.
- Stankey, George H. *Wilderness fire policy: an investigation of visitor knowledge and beliefs*. Research Paper INT-180. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1976. 17 p.
- Stankey, George H. Use rationing in two southern California wildernesses. *Journal of Forestry*. 77(6): 347-349; 1979.
- Stankey, George H.; Cole, David N.; Lucas, Robert C.; Petersen, Margaret E.; Frissell, Sidney S. The limits of acceptable change (LAC) system for wilderness planning. General Technical Report INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1985. 37 p.
- Stankey, George H.; Lucas, Robert C.; Lime, David W. Crowding in parks and wilderness. *Design and Environment*. 7(3): 38-41; 1976.
- Stone, Gregory P.; Taves, Marvin J. Research into the human element in wilderness use. In: Proceedings, Society of American Foresters, 1956; 1956 October 15-17; Memphis, TN. Washington, DC: Society of American Foresters; 1957: 26-32.
- Superior National Forest. *Wilderness use estimates-1984*. 1984. Unpublished report on file at: U.S. Department of Agriculture, Forest Service, Superior National Forest, Duluth, MN.
- Taves, Marvin J.; Hathaway, William; Bultena, Gordon. *Canoe country vacationers*. Miscellaneous Report 39. St. Paul, MN: University of Minnesota, Agricultural Experiment Station; 1960. 28 p.
- Taylor, Dorothy T.; Mackoy, Robert D. *Winter recreation in the White Mountains: users' characteristics and information needs*. Gorham, NH: Appalachian Mountain Club, Research Department; 1980. 103 p.
- Taylor, Dorothy T.; Spencer, Edward L. Participant profile of backcountry winter recreationists. In: Proceedings, North American symposium on dispersed winter recreation; 1980 February 27-29; St. Paul, MN. Office of Special Programs-Educational Series 2-3. St. Paul, MN: University of Minnesota, Agricultural Extension Service; 1980: 20-24.
- Thorsell, J. W. A trail use survey: Banff and Yoho National Park, 1967. *Recreational Research Report 33*. [place of publication unknown]: National Parks Service-Planning, National and Historic Affairs Branch, Department of Indian Affairs and Northern Development [Canada]; 1968. 57 p.
- Timm, W. N. A comparison of the carrying capacity perceptions of eastern and western wilderness users. Blacksburg, VA: Virginia Polytechnic Institute and State University; 1980. 125 p. M.S. thesis.
- U.S. Department of Agriculture, Forest Service. NFRS [National Forest Recreation Survey] Form No. 10. Table G, summary of NFRS. Forest Service Summary, Appendix 18. Washington, DC; 1961. 2 p.
- van Wagtenonk, Jan W. The effect of use limits on backcountry visitation trends in Yosemite National Park. *Leisure Sciences*. 4(3): 311-323; 1981.
- van Wagtenonk, Jan W.; Benedict, James M. Wilderness permit compliance and validity. *Journal of Forestry*. 78(7): 399-401; 1980.
- Washburne, Randel F.; Cole, David N. Problems and practices: a survey of managers. Research Paper INT-304. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1983. 56 p.
- Wenger, Wiley D., Jr. A test of unmanned registration stations on wilderness trails: factors influencing effectiveness. Research Paper PNW-16. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1964. 48 p.
- Wenger, Wiley D., Jr.; Gregersen, H. M. The effect of non-response on representativeness of wilderness trail register information. Research Paper PNW-17. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1964. 20 p.