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# forest service wilderness research in the rockies

WHAT WE'VE LEARNED  
SO FAR

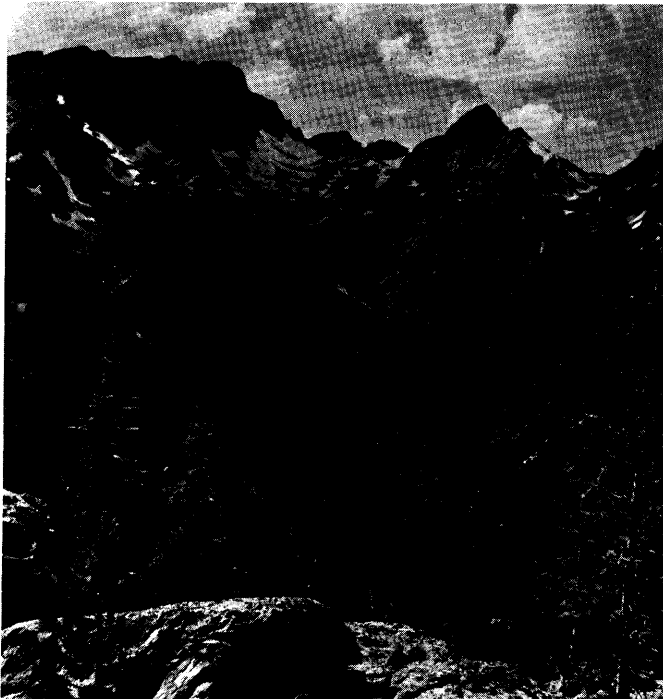


Photo courtesy U.S.D.A. Forest Service

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The first Wilderness Areas were established in the National Forests in the 1920's and most of today's system was designated, usually as "Primitive Areas," in the 1930's. The Forest Service takes pride in its pioneering contribution to the wilderness concept, but recognizes that implementing the wilderness concept is an ongoing challenge.

The challenge grows more difficult all the time. Wilderness has many scientific, cultural, and recreational values—but recreational use is the root of the growing management challenge and the focus of Forest Service research. People are visiting Wildernesses more and more, totaling a record 6 million visitor-days in 1972 (a visitor-day equals one visitor for 12 hours). Visitation is 15 times as great as it was in the late 1940's. This rate of increase is much greater than that for auto campgrounds and many other activities, despite the fact that this was when the post-war camping boom took off.

Projections of future wilderness use also are very high and no leveling off is in sight yet. Even energy shortages may not keep people out of the wilderness. The activities themselves—hiking, backpacking, horseback riding, river floating, ski touring, and so on—use no gasoline. Getting there may not use a lot of gas, either—our visitor surveys in Montana, Idaho, Utah, and Wyoming show that about three-fourths of the visitors live nearby. A tankful of gas would get a large majority of the visitors to the trailhead and back home. In fact, gasoline shortages could divert some people from long auto-oriented vacations and visits with relatives far away to closer Wildernesses. (Almost everyone in the West lives within 200 miles or less of at least one Wilderness.)

The growing use points squarely at the dilemma that is the heart of the wilderness management problem. The law defines a Wilderness as a natural area, with very little imprint of man's activities, and with outstanding opportunities for solitude. This is also the way most people think a Wilderness should be. Both wilderness

ecosystems and the experience of wilderness solitude are vulnerable to damage and destruction by overuse. Increasing visitor pressure on a nearly constant area of wilderness is leading to overuse in more and more places. The area of officially established Wilderness and Primitive Areas (almost all in National Forests) has grown less than 5 percent since 1946, while during the same period use has gone up 1400 percent! This means that on the average, each square mile, foot of trail, or campsite has about 15 times as many people using it each season as it did less than 30 years ago.

Better wilderness management is essential in this situation, especially management of wilderness use, if man's impacts are to be controlled and offset and the wilderness kept wilderness. Many old, comfortable use practices and management policies need to be re-examined, and perhaps in many cases changed substantially. However, change is usually painful and the knowledge on which changes in management should be based is scanty. This lack of knowledge tends to add fuel to already flaming controversies over wilderness management decisions that are difficult to begin with. Time is short. Even a little knowledge, enough to reduce the range of uncertainty and reduce the chances of big mistakes, would be highly valuable, especially because damage to wilderness resources can be largely irreversible.<sup>1</sup>

This management challenge led to the creation of a new Forest Service research program in 1967, focused on wilderness management. This effort is headquartered in Missoula, Montana, as part of the research activities of the Intermountain Forest and Range Experiment Station. Forest Service research at Seattle and St. Paul has also dealt with some wilderness topics.

Missoula is a well-chosen center for wilderness research. The northern Rocky Mountains contain the largest concentration of wilderness in the contiguous 48-state area (leaving Alaska aside as a special case). There are 20 established Wilderness or Primitive Areas in National Forests, three major National Parks with wilderness lands, and a substantial area of still undeveloped roadless land in Montana, Idaho, Wyoming, and Utah. These 20 established Wilderness and Primitive Areas in the National Forests represent about one-fourth of the designated areas in the nation, and total almost 7 million acres, nearly half of the national acreage. The areas vary in size, type of use, and problems; thus they provide a good outdoor laboratory. Three areas are within 50 miles of Missoula, including the Selway Bitterroot and the Bob Marshall, two of the largest Wilderness areas in the country. There are hundreds of roadless areas on the National Forests in the northern Rockies, comprising around 20 million acres. Wilderness use in the northern Rockies is still relatively light compared with the Boundary Waters Canoe Area in

<sup>1</sup> Wilderness management philosophy and principles are discussed in a paper "Wilderness—A Management Framework" in the *Journal of Soil and Water Conservation* July-August, 1973 by Robert C. Lucas. Copies are available from the Intermountain Forest and Range Experiment Station, USDA Forest Service, 507 25th Street, Ogden, Utah 84401.

Minnesota or the Wildernesses of the Sierra Nevada Mountains in California. As a result, there are opportunities to study situations in the early stages of development and perhaps still head off some undesirable changes.

Missoula is the headquarters for the Northern Region of the Forest Service and the home of the University of Montana, with its Center for Wilderness Studies, which helps to make it a good base for wilderness research. The interest and cooperation of land managers in the Forest Service and the National Park Service, as well as of scientists in universities and other agencies is essential; so is the cooperation of conservation organizations and the general public.

### The Problems

The problems are as big and spread out as the country itself. One set of problems concerns how to manage and protect established Wilderness. Another set relates to deciding the purposes for which the roadless areas should be managed.

The Missoula wilderness research unit has only a two-scientist staff; therefore, it is concentrating on the first set of problems—how to manage and protect established Wilderness. This involves two broad classes of topics—ecological and social.

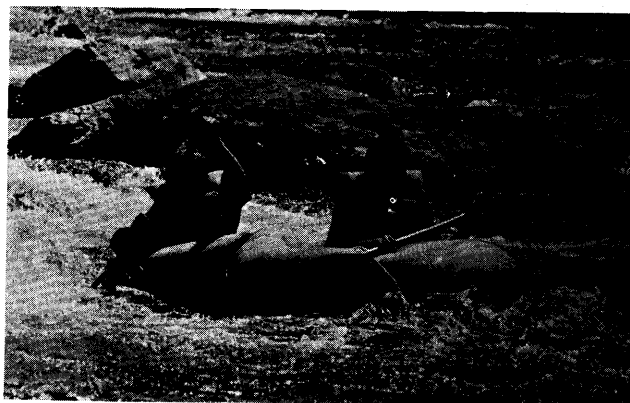


Photo by Dan Burden

### Ecological Research

Ecological topics run the gamut from the impact of visitors and their horses on plants, soil, water, and animals—mainly on campsites and along trails—to the processes of ecological change affecting the whole wilderness.

#### *Wildfire's Place in the Wilderness*

A central problem is the ecological role of natural wildfire and the results of its control. We have worked with the University of Montana School of Forestry on one fire ecology project. In this study, the vegetation history of the Danaher Creek basin in the Bob Marshall Wilderness was investigated by Professor Sid Frissell and several forestry students. By determining the ages of fire scars on trees and of even-aged forests that followed many fires, a series of fire history maps was compiled. The history goes back over 200 years, and shows many large

fires at lower elevations, especially in 1749, 1809, 1844, 1847, 1889, 1910, 1919, and 1937. At high elevations fires were small and did not bunch up into big fire years.

Another study was conducted jointly by Forest Service land managers and Northern Forest Fire Laboratory scientists in the White Cap Creek basin of the Selway Bitterroot Wilderness in Idaho. This study covered all aspects of fire's role in wilderness and led to a new fire control policy that allows some fires, under carefully specified conditions, to burn naturally.<sup>2</sup> Fire has been an important agent of change over the centuries, and its partial restoration helps in wilderness maintenance.

George Stankey, of our staff, is studying what visitors know about fire in wilderness and how they feel about it. He has found that most Selway-Bitterroot visitors reject policies that call for continued complete control of wildfire. The more visitors know about fire the more they tend to favor wilderness fire management programs that allow fire to play a more natural ecological role.

### *Campsite And Trail Studies*

The number of campsites suitable for use is important in determining visitor capacity because of the high value most visitors place on isolated campsites away from other visitors. Therefore, we have supported two cooperative studies of campsites by University professors. In one, Sid Frissell of the University of Montana School of Forestry looked at campsite conditions—wear and tear caused by use—on over 50 campsites in the Spanish Peaks Primitive Area. The sequence of deterioration on campsites was identified, and a "condition class" rating scheme was developed with suggested management actions for each class.

In the second study, which is still in progress, Professor Perry Brown and John Schomaker of Colorado State University are trying to develop a method to identify and inventory potential new campsites that might expand the capacity of the area if visitors knew of them. First they measured many characteristics of existing campsites in the Spanish Peaks, looking for critical requirements—levelness, size of level area, closeness to water, etc. Then they developed a system to locate spots on aerial photographs that meet these requirements. Last season they began field-checking the potential sites they had located to see how reliable the method was—i.e., were the potential sites really usable, and how many other usable sites had been missed?

The Spanish Peaks area has been used in conducting a number of field studies, several more of which will be covered later. It is a fairly typical area, and doubling up on it means that each study is strengthened by data from the others.

Another cooperative study with Washington State University investigated trail deterioration and related factors. Sheila Helgath, with Professor Dick Shew serving as her advisor, spent close to 6 months tramping

the trails of the Selway Bitterroot Wilderness in Idaho. She recorded trail condition, steepness of the trail and side slope, type of soils, vegetation habitat type, level of use, and more. Her results suggest use is *not* the main cause of deterioration—that the choice of location for the trail and how well it is built and maintained are critical.<sup>3</sup>

### **Social Research**

The social or user problems also are diverse. We do not know nearly enough about how people use the wilderness, what they are seeking, or how different kinds of policies would affect their behavior and satisfaction. One of the most pressing questions concerns recreational capacity, or how use affects the quality of the wilderness experience. What does "outstanding opportunities for solitude" really mean?

### *Carrying Capacity*

Estimating wilderness carrying capacity is a complex task; many factors must be considered. Traditionally, the term "carrying capacity" has been used to mean the ability of a biotic community to hold up under use; for example, the reaction of plants to cattle grazing. However, there are some real difficulties in trying to apply biological carrying capacities to wilderness management. Any use of an ecosystem creates some change; thus, unless we do not allow *any* use of wilderness, we must be ready to accept a wilderness environment something less than totally natural.

How much change is too much? The physical environment will not "tell" the wilderness manager how much use is "too much." Nor does it provide any clues as to how the characteristics of use (other than total numbers) affect the experience of the wilderness visitor. On some sites, where the ecosystem is relatively resilient and hardy, fairly large amounts of use might yield only small amounts of physical change; however, such large amounts of use may be entirely incompatible with what the wilderness visitor considers appropriate. Thus, the inevitability of biological change produced by any use necessitates some knowledge of how visitors define "too much change" and their attitudes as to what constitutes inappropriate use. Consequently, wilderness carrying capacity must be defined at least in part as the ability of an area to provide the visitor with a satisfactory wilderness experience over time.

During the 1969 summer use season, nearly 500 visitors to four areas—the Bob Marshall Wilderness in Montana, the Bridger Wilderness in Wyoming, the High Uintas Primitive Area in Utah, and the Boundary Waters Canoe Area in Minnesota—were contacted and asked to complete a questionnaire on how they felt about four broad dimensions of wilderness carrying capacity: (1) the level of use; (2) the types of use (for example, backpackers vs. horseback groups); (3) the location of encounters with others and the timing of those encounters; and (4) the

<sup>2</sup> For more information on this program, read *The Natural Role of Fire*, available from Northern Region, USDA Forest Service, Missoula, Mont. 59801.

<sup>3</sup> A Forest Service Research Note by Sheila Helgath reporting on this study will be out soon and will be available from the Intermountain Forest and Range Experiment Station.

effects of inappropriate behavior, specifically littering and campsite wear and tear. An attitude scale enabled us to determine how closely each respondent's concept of wilderness agreed with the Wilderness Act.

The people whose ideas were fairly close were called "purists" (maybe not the best word, but one that has been established through use). These persons, almost half of all visitors, seem especially relevant for wilderness decision-making because their personal definition of what is or is not desirable in wilderness is matched by the legal definition that governs management actions, although no one's opinion was ignored. In fact, we feel our research points clearly to the need for roadless primitive recreation areas, a little more developed than Wilderness, and with much more emphasis on enhancing recreational opportunities. For example, intensive fish stocking and management and wildlife habitat improvement might be appropriate in such areas to meet the needs of a large segment of the recreationist population.



Photo courtesy U.S.D.A. Forest Service

*In western Wildernesses, conflict exists between backpackers and horseback parties*

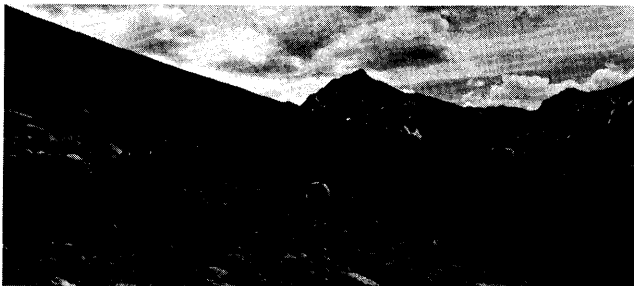


Photo by Dan Burden

As we expected, level of use encountered was one important influence on visitors' definitions of capacity, especially for purists. Almost all visitors defined solitude as an important attraction and enjoyed experiencing it.

It is misleading, however, to speak only of numbers and ignore the type of use involved. Conflicts between different travel methods and between different sizes of groups also have an important bearing on any wilderness

capacity policy. In western Wildernesses some conflict exists between backpackers and horseback parties. This kind of conflict is much greater in the BWCA between paddling canoeists and outboard motor users.

For the three western areas together, both hiking and horse travel were acceptable; however, there was considerable difference in the magnitude of agreement about this from one area to another. In the Bob Marshall and Uintas, where horse travel is common, it was accepted as appropriate by almost everyone. In the Bridger, where only 15 percent of the visitors used horses, the proportion feeling horse use was appropriate dropped to 80 percent, still a high level of acceptance.

Outboard motors in the BWCA were rejected as inappropriate by most unmechanized visitors and by almost all purists (85 percent of the purists objected to meeting visitors using motors.)

We asked visitors to tell us how they would feel about encountering increasing numbers of users. We specified as follows: (1) meeting only backpackers (canoeists in the BWCA); (2) horseback riders (motor boaters in the BWCA).

Although some variation occurred, the average response of purists to encounters for the three western areas is shown in figure 1. The slope of the curve for tolerance to meeting backpackers is relatively gentle, but two encounters a day is about the limit for a majority of purists. However, a majority of purists indicated they could meet only one horse-party per day and still have a satisfactory experience.

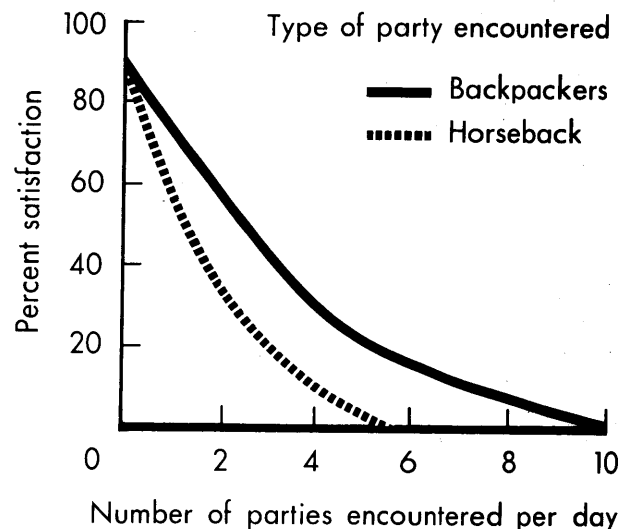


Figure 1—Curves showing changes in percentage of purists in three western study areas having a satisfactory wilderness experience with an increasing number of daily encounters.

In the West we found a general similarity between the curves, but the responses of BWCA purists to the two modes of travel was very different (figure 2). Motor boats have a severe impact on wilderness experiences for the

purists. Such use represents a major constraint on capacity standards for the BWCA.

Several past studies have reported a strong concern

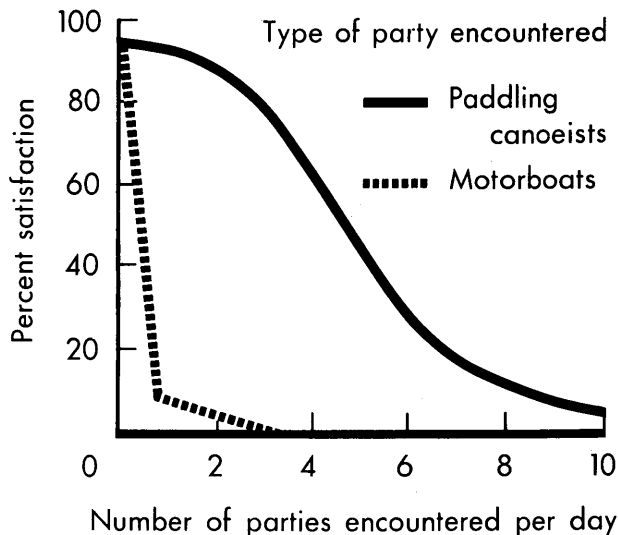


Figure 2—Curves showing changes in percentage of purists in the BWCA having a satisfactory wilderness experience with an increasing number of daily encounters.

among Wilderness visitors about large parties. We asked visitors several questions concerning the appropriateness of large groups. We defined “large parties” as a dozen or more people.

Most purists felt that encountering a large party cut down their feeling that they were in the wilderness. Overall, about 80 percent of the purists rejected large parties, ranging from 75 percent in the BWCA to 90 percent in the Bridger.



Photo courtesy U.S.D.A. Forest Service

*Large parties are a particularly disliked type of encounter for the Wilderness purist*

Visitors also were asked to express a preference for the following: (1) seeing one large party during the day or one small party a day; (2) seeing one large party a day or five

small parties a day; and (3) seeing one large party a day or ten small parties a day.

As expected for No. 1, purists definitely favored the one small party (88 percent); for No. 2, a majority favored the five small parties (57 percent). Surprisingly, however, for No. 3 half preferred the ten small parties! Ten small parties would mean an average of about one encounter per hour. Given the importance of solitude to the purist, we had assumed they would “trade-off” their dislike for large parties for a greater chance to enjoy being by themselves. Less than a quarter expressed a preference for the large group, however.

Obviously, our data suggest that large parties are a particularly disliked type of encounter for the purist. Visitor reactions to large groups may stem from one or more of the following beliefs: (1) large parties represent an inappropriate way of using the wilderness; (2) large parties create a disproportionate amount of resource damage; (3) large parties contribute to the problems of overuse and crowding; and (4) large parties suggest the city environment from which visitors seek temporary escape.

We also found that where one meets other groups makes a lot of difference in terms of how those encounters affect satisfaction. There are two basic locations where encounters take place; while traveling (along trail, lake, or portage) or at the campsite. Trail encounters had less impact on satisfaction. When given a choice, most purists preferred meeting others around the periphery of the wilderness. Encounters in the “interior” were considered more disturbing, particularly if they occurred near one’s own campsite.



Photo by Steve Gilbert

Almost 90 percent of the purists agreed that it was best when no one else was near their camp. When questioned as to what they would do if others set up camp nearby, between 80 and 85 percent of the purists in each area said they would suffer a loss of enjoyment; many indicated they would either cut their trip short or move their camp.

We also focused on two aspects of human behavior that leave their mark on the wilderness experience as well as on the environment: campsite damage and littering. We expected, and found, strong concern about sites that showed evidence of overuse—soil erosion, damaged vegetation, and so forth. The concerns about damage and littering were uniform for all areas, and purists did not show any more concern than did the overall visitor sample.

We asked visitors which bothered them more: seeing too many people or finding a littered campsite. Nearly 70

percent of the purists were bothered more by finding litter than by seeing too many people. This, of course, has considerable significance for Wilderness managers. Intensifying litter clean-up is a much less controversial action than restricting use.

Are our Wildernesses presently being used beyond their carrying capacities? To some extent, the answer is yes. Slightly more than a third of the purists felt the area they had visited was "overused," at least in some portions. Generally, these zones of crowding were related to two factors: (1) well-developed access, both in terms of roads leading to the Wilderness boundary and trails within the Wilderness proper, and (2) opportunities for good fishing, especially in areas that were readily accessible to the day visitor.

What do we mean when we speak of managing for a "high-quality wilderness experience"? We don't mean that wilderness recreation represents the high end of a quality continuum, with some type of mass recreation experience at the other end. There are high- and low-quality wilderness recreation experiences as there are high- and low-quality mass recreation experiences. For wilderness experiences we have judged quality against both a legal framework (the Wilderness Act) and the perception of those visitors we define as purists. Thus, a "high quality" experience would be characterized by very few encounters with others in an environment where man's evidence was minimal. In the BWCA, this would also involve no encounters with outboard motors. Camping locations would afford the visitor complete solitude. Conversely, we could define a "low quality" wilderness experience as one involving numerous encounters, perhaps with large parties, an inability to locate an isolated camp, and where one continually encountered evidence of man's presence.<sup>4</sup>

The carrying capacity study has been repeated in a revised version in the Spanish Peaks Primitive Area in Montana and in the much more heavily used Desolation Wilderness in California. The Spanish Peaks results (analysis is almost done) have confirmed the results listed above with some refinements. The Desolation results are not yet in, but we are very interested to see what differences may exist that might be tied to the heavy use. It could be a forecast of things to come in the northern Rockies if it is allowed to happen.

#### *Use Measurement*

In another completed study, we tested methods for accurately estimating recreational use of wilderness-type areas. We worked with Dr. Hans Schreuder and George ("Jim") James of the Southeastern Forest Experiment Station, a center for recreation use measurement research. The Mission Mountains Primitive Area in Montana was the guinea pig. We found that trail register data were incomplete (only about 65 percent of visitors registered), but that these incomplete data could be

<sup>4</sup> For more details on this study, write the Intermountain Forest and Range Experiment Station (see footnote 1 for complete address) and ask for Research Paper INT-142, "Visitor Perception of Wilderness Recreation Carrying Capacity," by George H. Stankey.

adjusted by using a correction factor to produce accurate estimates. Some kinds of visitors were less likely to register—for example, horsemen, hunters, day-users, and teenagers. We also found that the use of the area was different from what managers had expected. There was less horse use, more hiking, stays were shorter and use was much more concentrated at a few places than had been thought.<sup>5</sup>

#### *Wilderness Permits*

Permit systems are becoming common in Wildernesses in many parts of the country and may be adopted in the National Forests of northern Rockies—the National Parks there have already made this move. Although the use measurement system just discussed was fairly accurate, it would be expensive, and it looks less desirable than a permit system. The information from permits could make possible much more effective research on Wilderness use, as well as strengthen management's ability to protect Wilderness, particularly by increasing contact and communication with visitors.<sup>6</sup>

#### *Visitor Characteristics*

A "baseline survey" of summer and fall visitors to Wilderness and related major backcountry areas in the northern Rockies was begun in 1970, during which seven such areas were surveyed, all in Montana. In 1971, the Selway Bitterroot Wilderness in Idaho and Montana was studied. We were after comparable data on the users of all of these areas, covering their activities, attitudes, and background. This information will help us select high priority topics for more detailed study, and study areas that are appropriate for specific topics. For example, our data suggest that a study of conflicts between horsemen and hikers or of the ecological effects of horse use would be a waste of time in the Cabinet Mountains Wilderness because only about 1 percent of the visitors there use horses. The baseline survey also will help us in applying the results of studies to other areas not included in particular detailed studies. Finally, the baseline will serve as starting point for measuring trends in the future.

The profile of visitors that emerged from the baseline survey was fairly consistent in most respects, with some variation related to the character of each area.

Most visitors were not "outsiders" who lived far away. About three-fourths of the visitors to Montana areas were from Montana. The Bob Marshall drew the most from out-of-state, about one-third. The Selway Bitterroot drew mainly from nearby Montana, Idaho, and eastern Washington. Most parties were small family groups or groups of friends, not large, organization-sponsored

<sup>5</sup> For details see "Wilderness Use Estimation: A Pilot Test of Sampling Procedures on the Mission Mountains Primitive Area," USDA Forest Service Research Paper INT-109, available from the Intermountain Forest and Range Experiment Station. See footnote 1 for complete address.

<sup>6</sup> A paper by John Hendee and Robert Lucas, "Mandatory Wilderness Permits . . ." reviews the advantages and disadvantages of permit systems. It is also available upon request to the Intermountain Station (see footnote 1).

groups. About three-fourths were hikers—only the Bob Marshall had a majority of horse riders. Less than 10 percent of the visitors employed outfitters, and most spent less than \$10 for all other costs. None of this agrees with the widespread stereotype of the big-city Wilderness visitor who needs lots of money to afford a trip.

Fishing and photography were the two most common activities, with a little over half the visitors doing each. Hunting was less common—around 15 percent participation overall—but it involved over one-third in the Bob Marshall and Middle Fork of the Flathead. Most people did a number of things; few wilderness trips were single-purpose visits.

Visits usually were short; in most areas, especially the smaller Wildernesses, day-users were in the majority. Trips of over a week were fairly rare everywhere. The idea that a person needs a great deal of leisure time to use Wilderness just doesn't fit the facts.

Visitors who had been to the area before often felt quality was going downhill, usually due to growing use and its effects. About one-fourth felt the area had too many visitors. The problem of growing use threatening Wilderness values certainly seems real.

Generally, most visitors would rather take their Wilderness pretty straight. There was not a lot of support for developments or facilities beyond simple trails and bridges over dangerous stream crossings. Outhouses were opposed by about as many as favored them, and tables and fireplaces were much less popular.

Most visitors approved of restrictions when necessary to protect wilderness, such as limiting use, requiring registration and setting a limit to party size.

A majority did not know the correct (or at least officially approved) way of handling garbage. Most thought it should be buried; but this disturbs the environment, usually attracts bears and other animals, and sooner or later degrades the campsite area. Non-burnable garbage should be packed out (the "pack it in, pack it out" policy). This emphasizes the need for more effective communication with visitors. Information on other ways of treating the wilderness with tender, loving care may also be bypassing many visitors.

There is much more—we have data on over 100 aspects of the visitors and their trips—but this gives you some idea of the picture that is being filled in and how parts of it may relate to planning Wilderness management.

#### Use Simulator

A study carried out in cooperation with Drs. John Krutilla, Kerry Smith, and Mordechai Shechter of Resources for the Future, Inc. has produced an exciting new tool for planning how to manage Wilderness use. They developed a simulation model of Wilderness visitor flows—in effect, a sort of Wilderness in a computer—that enables a Wilderness manager to try out some policy under consideration (for example, limiting use at the most popular trailheads to some level, letting use increase by some amount, building a new trail, or any one of hundreds of other real possibilities). The manager can run

the policy change through the computer and in minutes get a pretty good idea of what the resulting use pattern would be, what would happen to the number of encounters between parties, and how crowded camping areas would be. He doesn't have to actually try it out and wait at least a year to see if it worked as he hoped; if problems appear, he can make some immediate adjustments and try again. He could also find out what is likely to happen if use is allowed to grow unchecked for another 5, 10, or 20 years. Reliable data on use from a permit system such as was discussed above could make the simulator a more effective management tool.

#### Use Distribution

I am beginning a study of use distribution—how people spread out and bunch up, why, and how they might be encouraged to use the Wilderness more evenly. We have worked out a way to describe how even or uneven the pattern is (fig. 3), and calculated an index number that enables us to compare different areas or the same area at

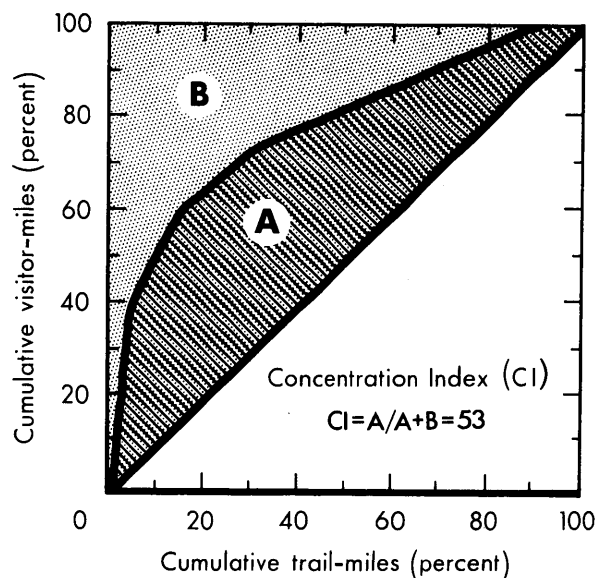


Figure 3—Spanish Peaks Primitive Area use concentration index (all trail use 1970).

different times. The curve on the graph shows the proportion of total use on any part of the trail system—for example, only 10 percent of the trail system in the Spanish Peaks accounts for about 52 percent of all use. The more the curve rises above the 45° diagonal, the more uneven the use is, and the higher the index number. A perfectly even distribution would equal 0; a completely uneven pattern of extremely concentrated use would equal 100. The Spanish Peaks' index is 53, whereas the larger Selway Bitterroot's is 67, which indicates more uneven use.

We will be conducting a study this season in cooperation with Frank Salomonsen, Ranger on the Stevensville District of the Bitterroot National Forest, to see how much use patterns can be shifted just by giving visitors information about the use patterns in a map and brochure. Are people really looking for solitude? Will

they change their choices of trails if they know which ones are crowded and which ones aren't? We will try to find out, and we are hoping the answer is yes, because modifying use with information is much more appealing than some sort of rationing scheme. Of course, light-handed management that protects as much of the visitors' freedom as possible requires more knowledge and more professional skill to apply than strict, authoritarian control. We hope our visitor studies and the use simulator can provide us with the information and tools needed to indirectly manage use.

#### In Conclusion . . .

We are trying to lay a foundation of general visitor studies and develop better research methods for more detailed studies later. This should provide the most relevant, helpful research in the long run and seems a better bet to us than crash programs dealing with individual "brushfire" crises.

There are serious gaps in our program; two scientists can only do so much. The physical and biological aspects of the environmental impact problem deserve more study. A good deal of pertinent knowledge in related subjects needs to be tied together and brought to bear on this management challenge.

The whole question of objective guidelines for helping

managers decide how to use "de facto wilderness"—roadless, undeveloped lands not classified as Wilderness—needs much more study. What lands should become Wilderness, or roadless but non-wilderness recreation areas, or developed road access areas? It is a big, tough problem, with few easy handles. It would require a multi-disciplinary team of ecologists, economists and other social scientists to tackle it productively and they would need a good deal of time for in-depth studies. Final, last-word answers probably could never be produced, but the decisions could certainly be assisted by organized, relevant knowledge.

Wilderness is only part of the environmental issue, but it is a valued, important part for many people for many reasons. Present research efforts look very small in comparison with the importance of the problem, regardless of how importance is measured. If research could make possible even small improvements in wilderness planning and management, this could repay many times the cost of the research. I think wilderness is too valuable, and change too rapid and too often irreversible, to be satisfied with the current level of research on wilderness problems. The efforts and cooperation of researchers, managers, and users all will be required to protect our wilderness heritage and use it carefully.



Photo by R. W. Behan