Quality Skiing at Aspen, Colorado

UNITED STATES PROGRAM ON MAN AND THE BIOSPHERE

MAB

Unesco MAB Project 6

A STUDY IN RECREATIONAL CARRYING CAPACITY

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Occasional Paper No. 14
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INSTITUTE OF ARCTIC AND ALPINE RESEARCH • UNIVERSITY OF COLORADO

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Institute of Arctic and Alpine Research
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Boulder, Colorado 80302

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Based on work performed under a fellowship provided by
the Aspen Skiing Corporation, Aspen, Colorado

ISSN 0069-6145

FORWARD

Who skis at Aspen? Denverites, New Yorkers, or people from the Mid-West? What is the age structure, sex, income, and professional and business associations of these skiers? What do they expect to find at Aspen: high quality skiing, good restaurants, a chance to relax in a warm winter sun, or a combination of these? Are their expectations realized? Will they return next year? What do they and you understand by the term "quality skiing" and how much does and should it cost?

Another group of questions might well address the problem of how the National Forest Service, the Aspen Skiing Corporation, and the Town of Aspen are responding to increased demand for ski lift tickets, in face of local concern over accelerating growth of support facilities and residential construction. A final group of questions relate to whether or not, or to what extent, conditions in Aspen are comparable to other ski resorts in Colorado, and in the United States at large.

For decades the mountain areas of the world, and especially those in middle latitudes and within the territories of the affluent nations, have been considered a source of inspiration and a playground for a privileged few. The everlasting hills were regarded as immutable. Since about 1950 in the Alps, and 1965-1970 in the Colorado Rocky Mountains, affluence, increased ease of access, population expansion, and their attendant development of pressures for recreation in the fullest sense have so augmented utilization of the mountain environments that a critical situation has arisen. This complex of pressures has been debated by the environmentalists and by the land managers. A wilderness ethic has matured in the United States; at the same time, the need for relief from the stresses of city living has been widely recognized. It should be obvious that unlimited growth in use of our mountains will destroy the very characteristics that prompted such growth in the first place. Yet recreational use of mountains involves a very large range of activities and many types of people, and the overlapping of such activities and groups in the same area is not necessarily compatible with rational management practices. But who defines needs, priorities and balanced land utilization? Do we remotely understand what questions need to be asked and subjected to scientific investigation?

This enormous problem of recreational impact on middle latitude high mountains has reached such serious proportions that it has been designated as a special area for national and international research. Thus it is strongly emphasized within the new Unesco Man and the Biosphere Program (MAB), Project 6--Study of the impact of human activities on mountain and tundra ecosystems. One small but important segment of this program is aimed at defining the recreational experience itself. Thus definition of quality snow skiing at Aspen will provide valuable insights for the broader national and international research effort, and because of this, the present study has been identified as a contribution to the Man and the Biosphere Program: Project 6.

This study by Coe Crum London will answer many of the questions posed in the opening paragraph and will raise many more. Her involvement in Aspen skiing "politics" came about through an unusual combination of circumstances. The study was made possible through the foresight of the Aspen Skiing Corporation in establishing a graduate fellowship fund through the Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, in 1973. The opportunities and constraints of this generous award are unique and since Coe was the first recipient, it is perhaps appropriate to provide an explanation here. First, the award takes the form of an annual grant to INSTAAR by the Aspen Skiing Corporation. INSTAAR in turn, selects a graduate student on the basis of widespread competition; the student's obligation being to pursue a graduate degree program. The only constraint is that the research topic be in some way related to the Aspen vicinity. From this point on, the Aspen Skiing Corporation acts as a benificent onlooker and provides a great range of material and moral support. Development of the study, its supervision and evaluation, rests with the student's research committee of university professors and INSTAAR. In this way, the integrity of the study is fully protected regardless of whether the findings may be pleasing or displeasing to individuals within the study area.

INSTAAR is a faculty and graduate research unit of the University of Colorado primarily concerned with the earth, atmospheric, and life sciences--geoecology--of regions of the world characterized by cold climates, the high mountains, and tundras. That the first Aspen Fellowship award was made to a behavioral scientist resulted from a decision to select the best candidate regardless of discipline. Thus the doctoral dissertation upon which this publication is based was submitted to the Department of Geography, University of Colorado. Nicholas Helburn, Gilbert F. White, and Kenneth A. Ericson served as principal supervising professors, and their contributions are greatly appreciated.

Many individuals and institutions assisted with the study, although only a few can be mentioned by name in the space available. Brian Knowles and Jay Baker provided invaluable assistance with the statistics and computer programs. The people of Aspen and several local town, county, and National Forest Service officials provided encouragement and support. The staff of the Aspen Skiing Corporation gave extensively of their time, provided data and constant encouragement. Finally, the many hundreds of skiers who submitted themselves to completing questionnaires made a vital contribution without which this study would have been impossible. The Institute of Arctic and Alpine Research also formally acknowledges the Aspen Skiing Corporation for establishing the fellowship program.

Jack D. Ives
Director, INSTAAR
May 1975

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ABSTRACT

Methods and guidelines are developed to determine the optimal use of ski slopes and their social carrying capacity. Emphasis is placed on the effects of crowding on users' attitudes and behavior.

The three ski areas operated by the Aspen Skiing Corporation in Aspen, Colorado, served as the study area. From the findings of a standardized interview, users' characteristics, motivations, satisfactions, and their evaluations of use were obtained. By placing a varied number of skiers on specific slopes, users' behavior has been observed under all types of density situations.

Results indicate that skiers' evaluations of use vary according to certain user characteristics, location, time, and weather and snow conditions. If the individual is under the age of thirty, has a high technical skiing ability, participates in other winter sports, or had parents that skied at any time, he feels congestion more acutely than skiers not in this group. Skiers sense more congestion on more difficult terrain and during the last two hours of the skiing day. Skiers are also aware that there is significantly lower use on Saturdays, during the first hour of the skiing day, and under some adverse snow and weather conditions.

Results also indicate that skiers feel that use on the ski slopes is within an optimal range except at Aspen Mountain during mid-February where users sense a crowded situation. However, in the near future, skiers may feel congestion at more places and for greater lengths of time, since analysis of present user characteristics and actual use trends confirm prospects for continued growth of the skiing population. In addition, the analysis of users' behavior confirms the hypothesis that skiers avoid skiing crowded slopes.

The study concludes with recommendations for maintaining the optimum level of carrying capacity characteristic of Aspen. Incorporated into the recommendations are the conflicting constraints of community attitudes and policies on growth, U.S. Forest Service policy, and the ski slope operators' views on growth and on restriction of use. The present method of restricting use by monetary means is reviewed in accordance with the historical view of use on public lands. Finally, specific research recommendations on recreational carrying capacity are suggested.

CHAPTER I

INTRODUCTION

The present allocation of outdoor recreational areas and facilities in the United States does not satisfy the rapidly and steadily increasing demand for recreational activities. Present demand and supply estimates indicate an enormous shortage of areas and facilities.[1] Attendance records reveal an increasing demand. This trend is likely to continue because a greater amount of the American citizen's disposable income is being spent for recreation.[2]

The rising demand in outdoor recreation, particularly in the last two decades, can be attributed to several economic, political, social, and physical processes. First, population statistics demonstrate that the continuing net growth in population will accelerate the recreational demand.[3] Second, increasing leisure time among all age groups will generate demand in all types of recreational activity. For example, where leisure time is available in large blocks, recreation will be sought at large resource-based areas, usually located far from residential areas, while leisure time in the form of shorter workdays and work-weeks will promote recreational growth within and immediately surrounding cities.[4] Third, general increases in personal per capita income make recreational activities and equipment available to a greater portion of the population. Increased affluence has also promoted growth of transportation, communication, and advertising; thus, there is greater mobility among the population, and access to recreational areas is enhanced by shorter travel time and general comfort.[5]

Several physical processes in the development of the urban landscape have prevented allocation of adquate open space and park acreage for the urban dweller. The process of urbanization has nearly eliminated the wild landscape from the city. Specifically, rapid development and attendant land speculation have created a totally man-made landscape with little open space. Furthermore, other major urban problems such as crime, flight from the inner-city, and air, noise, and water pollution have detracted from the amenities of the urban scene. Therefore, the lack of urban amenities and landscaping in the process of urban development has encouraged more of the populace to seek recreational activities as a form of escape from the city environment and has left planners with a lack of experience, research, and planning of outdoor recreation areas.[6]

An associated problem for recreational planning is the lack of accurate data on recreational activities. Not only are these data

nearly absent for federal-, state-, and county-owned lands, but also they are severely limited for privately owned lands. Without data, demands cannot be adequately satisfied, money cannot be used in the most beneficial way, methodologies for determining supply and demand cannot be accurately developed, and sufficient land acquisition cannot take place at the appropriate time. In essence, without sufficient data not only is research and planning not possible, but also the likelihood of coordination among different levels of government and privately owned areas is small.[7]

In particular, planners have recognized the qualitative dimension of recreational activities, although they find it difficult to define and analyze. Little research has been dedicated to the quality of the recreational experience. This situation is a result of both the intangible and subjective characteristics of the measurement of quality, and the complex issue raised by the question of whose concept of quality should be adlopted. Therefore, planners are left with making the tacit assumption that a given recreational activity does not vary in quality. It seems clear that planners need further developed research techniques and data basis to direct growth in recreational activities. Moreover, this need applies especially to private enterprises primarily involved in recreation.

The research reported here is concerned with developing criteria to measure social carrying capacity in a privately administered recreational activity, snow skiing. The effect of crowding on the quality of the recreational experience is specifically examined. From this analysis planners could determine carrying capacity levels and make more accurate recommendations for the allocation of natural resources in a spatial and temporal context.

Concept of Carrying Capacity

The concept of carrying capacity is old. In 1798 Malthus recognized and evaluated to what extent the land could support human life and satisfy human wants. Ricardo and Mills expanded upon the Malthusian theory in terms of land, labor, and capital. In the United States, the first consciousness of the man-land ratio was evident in the conservation movement of 1890-1920, the closing of the frontier. It was at this time that man began to perceive resources as absolute, realized his capability for destroying the environment, and recognized the need of contemporary social reform and sound management for the prevention of resource exploitation. From the 1890s to the present the significance of resource management has fluctuated. However, recently the population has shown an increasing awareness of the need for the protection and enhancement of environmental quality because of continued population growth, depletion of natural resources, the failure of some past resource management practices, and the need for new guidelines for public use of resources.[8]

Recently, the concept of carrying capacity has not only been recognized in the physical dimension, but also in the social

dimension. That is, carrying capacity is acknowledged as a function of social organization and technological levels. Areas of high population densities are often, although not necessarily, characteristic of stressful, overcrowded situations because human behavioral territories are conflicting. For example, those urban areas characteristic of racial tension and riots, increased crime and violence, dissatisfaction with urban renewal, and shortages of open space and parks exhibit the symptoms of exceeding the optimal carrying capacity level.[9]

In recreation, it is generally agreed that carrying capacity is defined as the optimum intensity of use or maximization of the user value of the recreational experience. This assumes that 1) once the optimum capacity is exceeded, the quality of the recreational experience is lessened and 2) users' impressions of crowding are dependent on the total number of people using the facility.[10] Furthermore, this concept of carrying capacity is directly linked to the instrument of benefit-cost analysis. When use exceeds optimal levels, benefits as measured by user satisfaction become negative and in effect, are a direct cost associated with the recreational use. To counter balance this situation an increase in direct costs, such as increments of management, maintenance, or facilities, could raise satisfaction levels to the degree that overall benefits outweigh costs, until the law of diminishing returns sets in for the cost of the entire facility.

Previous Studies

In the field of recreation, the study of carrying capacity in a social context is a new frontier. Work in this area has been limited to specific case studies and/or analysis of recreation users or managers. Therefore, in many respects, the work is segmented and incomplete for a systems type analysis.

For example, Robert Lucas has been concerned with differentiating the user's perception of wilderness in the Boundary Waters Canoe area. These differences of perception, as correlated with socioeconomic and background characteristics of wilderness users, provide a method of increasing and designating appropriate use for high quality recreational use in wilderness areas. Along these same lines, Charles Cicchetti has analyzed the relationship between users' preferences and behavioral patterns and 1) socioeconomic characteristics, 2) childhood residence and recreational experience, and 3) conformity with the purpose of the Wilderness Act. In a more detailed context B. L. Driver has established a conceptual framework on which to build an understanding of motivational determinants of forest recreational use. This area of inquiry leads to a fuller understanding of user satisfaction and criteria to define the real benefits reaped from recreation.[11]

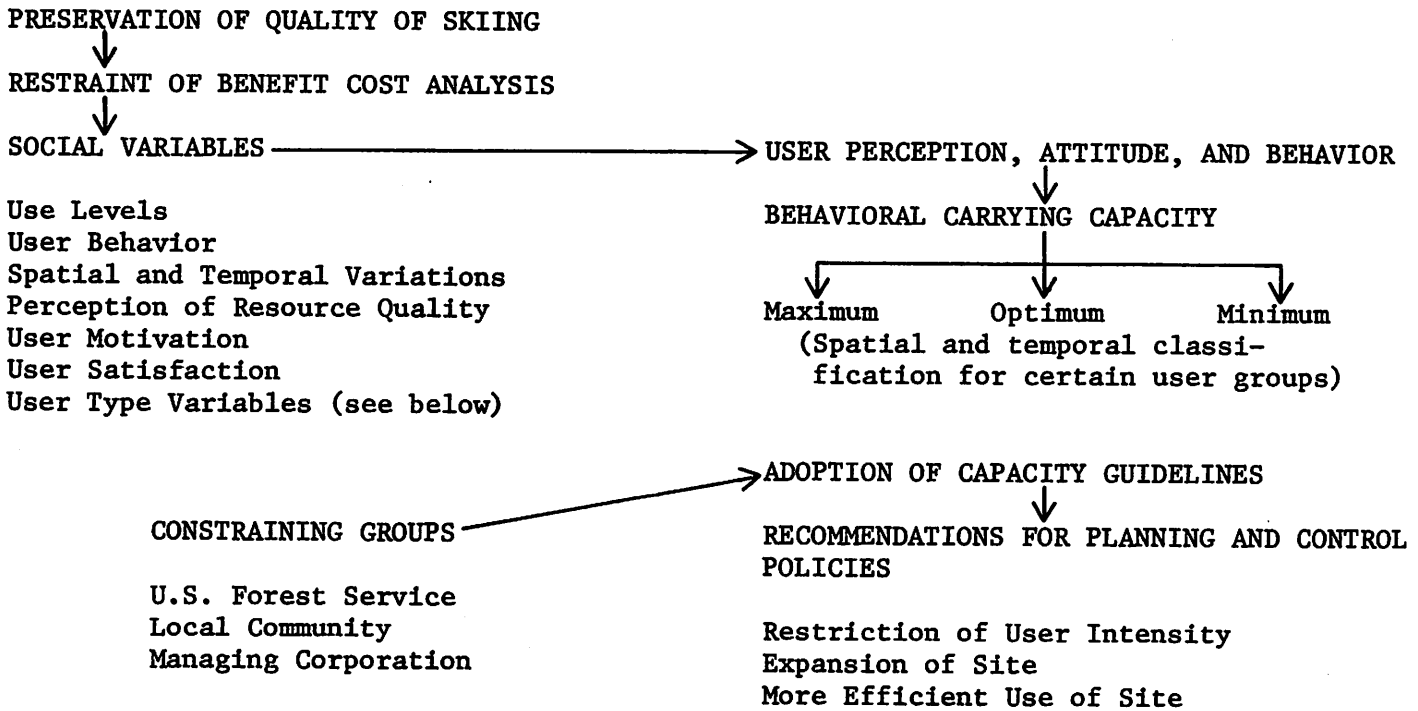
George Stankey, John Krutilla, and A. C. Fisher have directed their studies to the management aspects of wilderness recreation in examining carrying capacity. Stankey devised an attitude scale to measure the extent to which the respondent's perception coincided with the objectives embodied in the Wilderness Act. Fisher and Krutilla have elaborated on benefit-cost analysis as a tool for measuring supply and demand. That is, they are concerned not only with aggregating the consumer willingness to pay for recreation, but also devising a way to measure the effects of varying levels of congestion on this willingness to pay.[12]

It is the purpose of this study to expand upon various aspects of carrying capacity criteria for recreation, particularly users' perception, attitudes, and behavior. All previous case studies have dealt with wilderness recreation, but this one focuses on snow skiing. This study integrates and analyzes the effect of both the user's and the manager's attitude and behavior regarding actual use and demonstrates the effect of crowding on user's behavior.

Theoretical Framework of the Study

A model for the criteria believed to be important in the measurement of carrying capacity for the preservation of a quality recreational experience in snow skiing has been developed (Figure 1). The basic premise of the model is that the measurement of human carrying capacity is dependent on several social and behavioral variables. First, the capacity of a recreational facility depends on its area, facilities, maintenance, and management, and the pattern of its use. Second, user characteristics, motivations, and satisfactions must be considered in the measurement of quality of recreational experience. It is then possible to calculate differences in user attitudes and behavior in crowded situations in order to determine relative levels of carrying capacity of certain areas within the total skiing area at varying times. This in turn leads to and supports adoption of carrying capacity guidelines and recommendations for management and planning. However, certain constraints (such as U.S. Forest Service and private industry regulation policy, and growth projections of the town and base facilities) must be integrated into the model for realistic implementation of the guidelines.

The details of the study design follow in this chapter. The nature of actual use in relation to potential and future use of the ski area is described in Chapter II. In Chapter III skiers' evaluations of use are described and related to socioeconomic, demographic, residency, accessibility, and past experience variables. Those areas and facilities where users detect crowding are described in a spatial and temporal context. The changes in attitudes and actual behavior in crowded situations are analyzed in Chapter IV. The study concludes by relating levels of crowding to recommendations in planning for skiing facilities, base facilities, and the growth projection for the town and ski area. Recommendations are made in the context of a



User Type Variables

Demographic (age, sex, marital status)
Socioeconomic (completed education, occupation, income)
Place of residence
Background experience with skiing and other winter sports
Size of group with which the individual is skiing
Cost of skiing
Attitudes toward management and maintenance of area
Anticipation of crowding
Accessibility

Figure 1. Model for social carrying capacity.

private industry using public lands and the method of restriction on use and growth of the ski area and town.

Study Design

The ski area in Aspen, Colorado, was selected for the study area. Aspen is located in Pitkin County, west-central Colorado (Figure 2). At an elevation of 8,000 feet in the Roaring Fork Valley, Aspen is surrounded by mountains and is an ideal service center for various types of recreation, especially skiing. The ski area, located within a twenty-mile radius of Aspen, is comprised of four separate mountains. The three mountains operated by the Aspen Skiing Corporation (Aspen Mountain, Buttermilk, and Snowmass) are the study sites (Figures 3, 4 and 5).

The character of Aspen was developed in its early days of mining, remnants of which are still found today. The ski industry started in 1946, complemented by growth in year-around activities and the creation of a cultural center for humanistic and musical studies. By the early 1970s Aspen was well known as a very sophisticated, planning-oriented community and as an international cultural center which offered such programs as the International Design Conference, the Aspen Institute Workshops, the music and opera programs, and various summer art and humanities workshops. As a result of the "recreation boom," Aspen's resident population has grown almost 200 percent over two decades. At peak periods during the ski season the population now reaches 20,000. This population is not homogeneous in terms of personal characteristics, background, and motivation to participate in recreational activities.

Pitkin County is becoming heavily dependent on the recreation industry.[13] The growth in skiing is a leading indicator of change, a predictor of employment levels, retail sales, and total personal incomes. Since 1968 this growth has caused an economic boom (annual growth rate of 8 to 10 percent), both in Pitkin County and in Aspen.[14] However, fluctuations in the business cycle and national economy are known to threaten the recreation industry first. Intuitive judgment indicates that the county needs to attract a diversity of business, or perhaps maintain ranching as a strong second industry, to survive any economic disaster to the recreation industry.

Even though the recreation industry has contributed much to the economic base of the county and town in a short-term time period, the long-term effect remains largely unknown and could be highly detrimental. For example, planners are now faced with the complex problems associated with accelerated growth, such as land speculation; impairment of natural beauty and open space values; critical shortages of water; water, air, and visual pollution; traffic congestion; development of homes and recreational activities in areas subject to natural hazards; shortage of housing for the low and moderate income groups; and the loss of a small town intimacy characteristic of Aspen in the

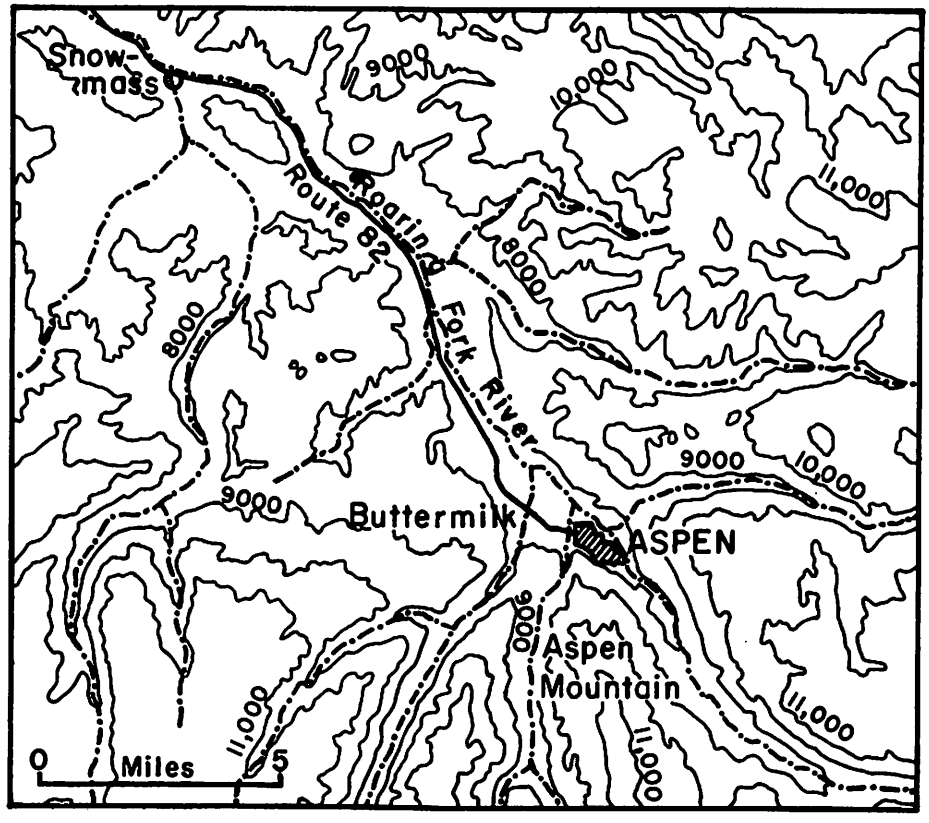


Figure 2. Location of Aspen, Colorado.

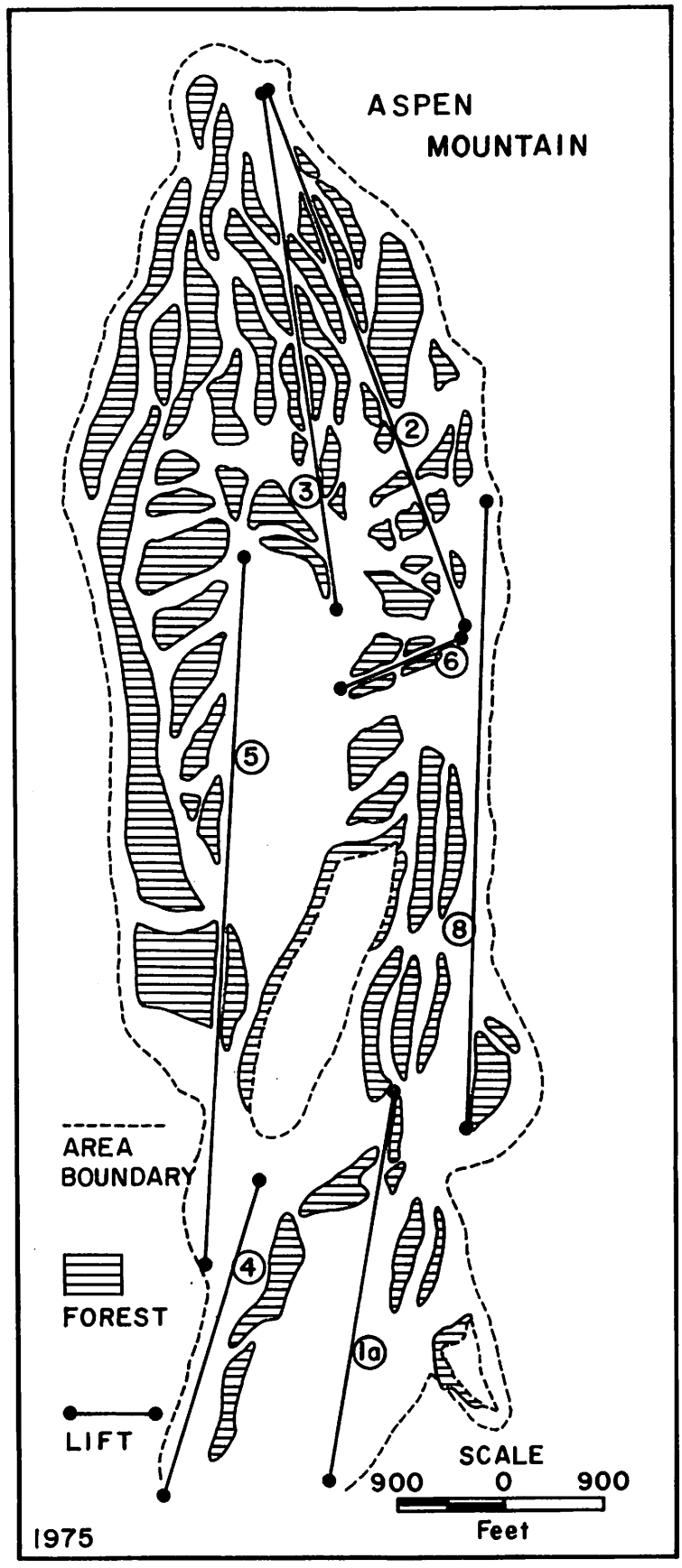


Figure 3. Aspen Mountain Ski Area.

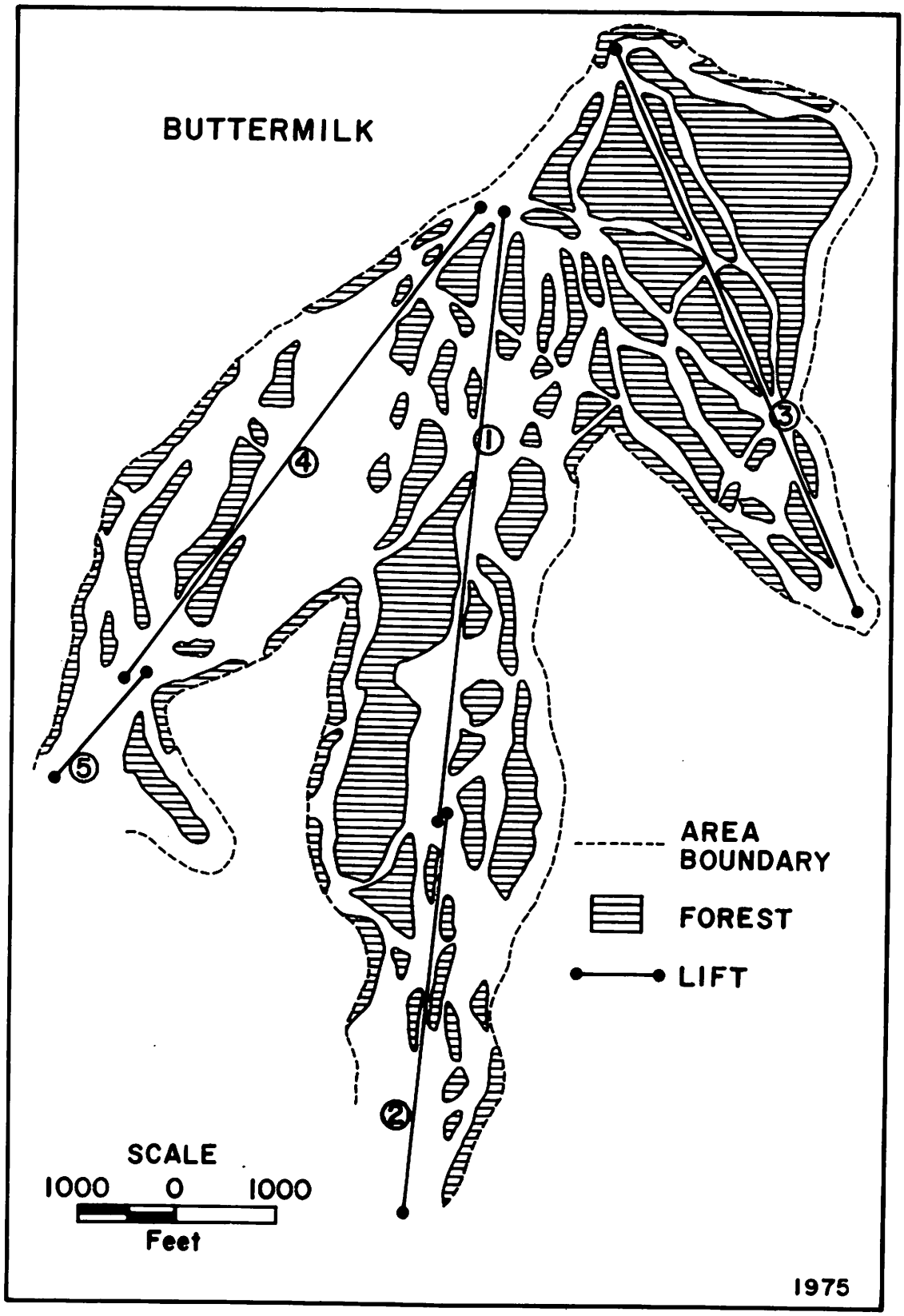


Figure 4. Buttermilk Ski Area.

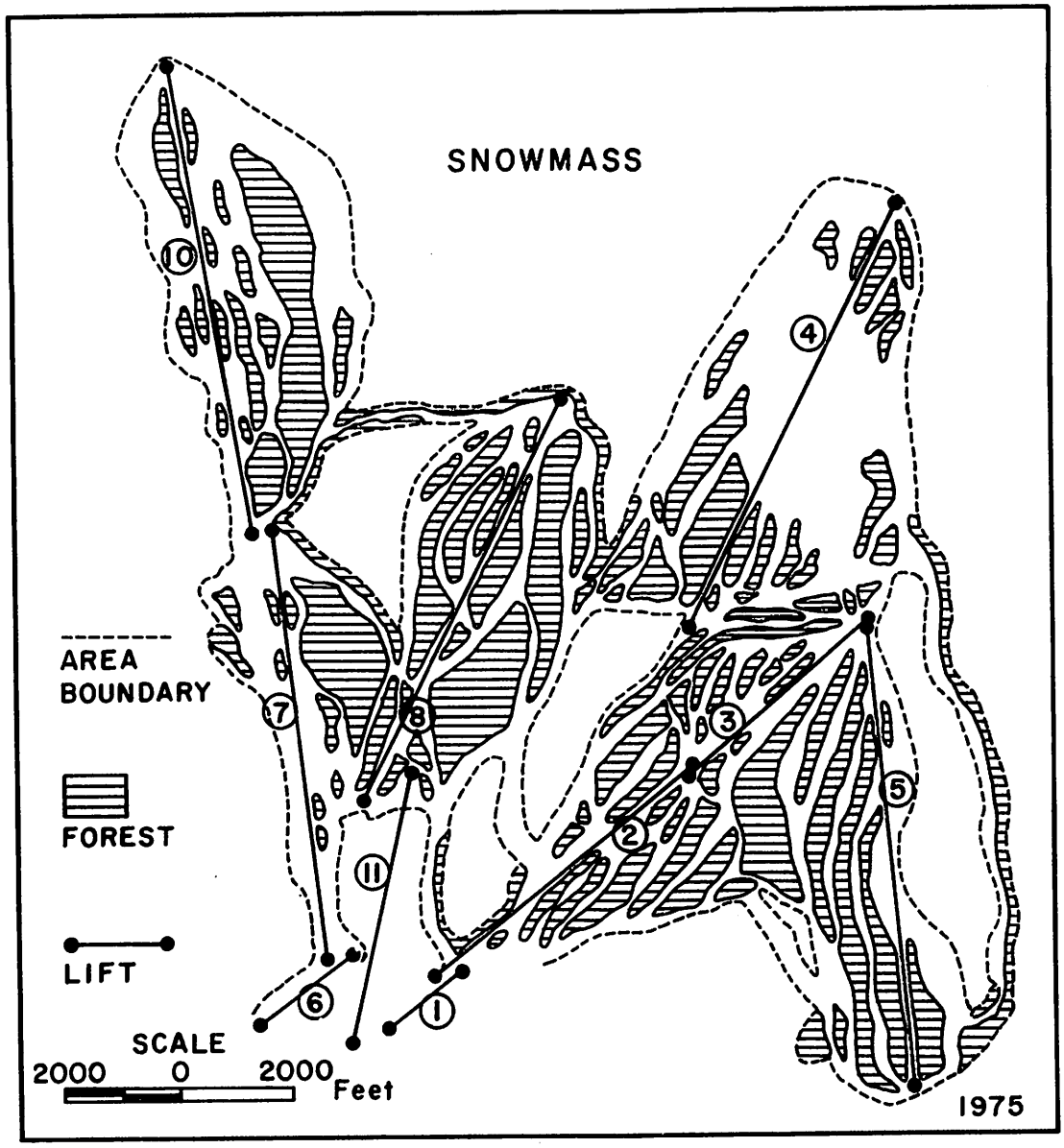


Figure 5. Snowmass Ski Area.

Plate 1. Aspen Mountain Ski Area (Photo courtesy of Aspen Skiing Corporation)

Plate 2. Buttermilk Ski Area (Photo courtesy of Aspen Skiing Corporation)

Plate 3. Snowmass Ski Area (Photo courtesy of Aspen Skiing Corporation)

1950s and 1960s. Not only has the cost of living risen to the highest of any town in the forty-eight contiguous states, thereby characterizing it as a community for the wealthy, but there has also been a highly significant rise in the number of people between the ages of twenty and twenty-nine in the last ten years. While the tax rates and demands per citizen are rapidly increasing, there is a considerable lag for revenues and services to satisfy the population's needs. But, because of polarized feelings within the community toward growth, the implementation and viability of any type of planned controlled growth by local government regulation and policy is improbable.[15]

Interviews

A standardized interview (Appendix A) was used to obtain the following information: 1) the particular ski area used by the individual, 2) the individual's impression of resource quality, his attitude towards management, and his expectation and tolerance of crowding in skiing, and 3) the socioeconomic and background characteristics of the user. Closed rather than open questions were preferred to facilitate answers from respondents, acquire the type of answers for precise, complete analyses, and aid in shortening the length of the interview. The primary disadvantage in using this type of questionnaire was loss of spontaneity and expressiveness from the respondents. However, the benefits of the closed question seem to outweigh this disadvantage. In addition, graphic scaling was used for questions concerning attitudes because of the following attributes of the technique: 1) it was simple and easily administered; 2) it was interesting and required little added motivation for the interviewee; 3) it could be quickly filled out; 4) it provided an opportunity for precise discrimination and fineness of scoring; 5) it avoided the errors of central tendency in the design of the scale; and 6) it provided interval data which could be used for more sophisticated parametric testing.[16]

The interview was administered from November 27 to March 31, 1973-1974, six days a week between the time of the opening and closing of lift facilities.[17] During this time period, from eight to fifteen interviews were given per day. One ski mountain was randomly selected each day for the general location of interviews which were conducted on ski lifts, at restaurants on the ski mountain, and at parking lots and bus stops serving the ski area. Several different interview locations were used in order to obtain information from all types of skiers.[18]

Interview Bias

Standardized questionnaires greatly reduced any bias in administration of the interview. After the first three weeks of interviewing, any questions which consistently seemed ambiguous were rephrased. Thereafter, when problems of interpretation arose with a specific question, the question was simply repeated; if confusion still existed, the question was omitted.

There was a very low refusal rate from people who were asked to do the interview, approximately two per week. Moreover, people seemed very willing to contribute their time and thoughts. This seemed to be a result of people being relaxed and on vacation, and the fact that the interview did not intrude on skiing time. Most of the refusals were from females or occurred in parking lots where people were in a rush to get home or to après ski entertainment. Once people consented to do the interview, there was a very low rate of refusal on answering specific questions. For example, refusal to divulge personal income was less than one percent.

In general, people commented that they liked the interview and of the twenty-five percent who tried to guess the objective of the interview, no one was correct. The interviewees seemed truthful in their answers; only two or three people flagrantly lied about personal or background characteristics in skiing. Specifically, with regard to reliability the question about crowding was scaled by both the interviewer and interviewee. These two sets of data highly correlated with an $\underline{r}$ value of .48, statistically significant at the .001 level.

A total of 1,186 interviews were completed throughout the season of which 696 were performed by the author and 490 by a field assistant. Statistical analysis revealed significant differences between the two sets of interviews (Appendix B). It was also noted that the field assistant did not record accurate weather information.[19] Therefore, the field assistant's interviews were not used in the analysis. It was felt that 696 interviews which did encompass the entire skiing season was an adequate data base from which to analyze results.

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13. This phenomenon is illustrated by the fact that of fifty-one million dollars personal income estimated to have been received by Pitkin County residents in 1973, thirty-three million dollars came from wages, salaries, and profits and rents generated by tourism and recreation business. Six million dollars came from income derived outside Pitkin County and received by people choosing to live in the county because of its attractions and amenities. Ten million dollars came from wages, salaries, and

profits on the construction of new and private facilities to serve tourist and the recreation business, including homes and condominiums. Two million dollars came from mining and agriculture. These facts appear in the work of John S. Gilmore and Mary K. Duff, The Evolving Political Economy of Pitkin County: Growth Management by Consensus in a Boom Economy, Report for the Board of County Commissioners, Pitkin County, Colorado, March, 1974 (Denver: University of Denver Research Institute, 1974), pp. 2-3.

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15. Ibid., pp. 10-11, 13, 17, 22; John S. Gilmore and Mary K. Duff, Policy Analysis for Rural Development and Growth Management, Report for the Rural Development Commission, June, 1973 (Denver: University of Denver Research Institute, 1973), p. 9; Juan Goldman, "Aesthetics Becomes Politics in Aspen," The Sunday Denver Post, May 26, 1974, pp. 1, 4.

16. J. P. Guilford, Psychometric Methods (2nd ed.; New York: McGraw-Hill Book Co., 1960), pp. 267-268; Claire Selltiz et al., Research Methods in Social Relations (2nd ed.; New York: Holt, Rinehart, and Winston, 1963), pp. 345-359.

17. If there were extenuating circumstances, interviews were not conducted for the day.

18. Delbert C. Miller, Handbook of Research Design and Social Measurement (2nd ed.; New York: David McKay Co., 1970), pp. 55-59; Dennis B. Forcee and Stephen Richer, Social Research Methods (Englewood Cliffs, N. J.: Prentice-Hall, 1973), pp. 121-134.

The interview locations at each mountain were stratified by area and then randomly selected to facilitate acquisition of a greater number of interviews. At the location of the interview people were randomly selected by the following techniques: 1) on lifts, the twentieth person or last person, if there were not twenty people, in the lift line; 2) in restaurants, the nearest person to the head of one randomly selected table; 3) in parking lots the nearest person to the center of the parking lot, and 4) at bus stops, the last person in line.

The specific locations of interviews at each mountain were the following: 1) Aspen Mountain - lifts 1A, 2, 3, 4, 5, 8; Gretels and Sundeck restaurants; Little Nell and 1A parking lots; 2) Buttermilk - lifts 1, 2, 3, 4; Cliff House, Buttermilk, and La Crepe restaurants; Tiehack and Buttermilk base parking lots; bus stop; 3) Snowmass - lifts 1, 2, 3, 4, 5, 6, 7, 8, 10, 11; Timber Mill, Sam's Knob, Ullrhof, Rack and High Alpine restaurants; Fanny Hill and Campground parking lots; Fanny Hill bus stop.

19. Statistical analysis was done only during the time period from December 27 through March 1, when both the author and assistant were interviewing.

CHAPTER II

USE CHARACTERISTICS OF THE ASPEN SKI AREA

Aspen offers the largest ski area and facilities in Colorado with excellent natural conditions. The area also seems to attract the majority of skiers in Colorado. From 1950-1960 Aspen Mountain accounted for the largest number of skier visits and during the 1971-72 season Aspen Skiing Corporation issued the greatest number of lift tickets in Colorado.[1] It seems clear that the rapid and sustained growth of skiing in this area (Table I) could have a direct effect on the quality of the recreational skiing experience for the individual, especially if ski area expansion is curtailed.

TABLE I

ANNUAL SKIER VISITS

Year	Total Skier Visits*	Aspen Mountain	Buttermilk	Snowmass
1954/55	62,000	62,000		
1955/56	85,000	85,000		
1956/57	83,000	83,000		
1957/58	104,300	104,300		
1958/59	139,400	139,400		
1959/60	162,870	117,960	14,990	
1960/61	150,060	107,120	20,280	
1961/62	193,132	142,140	23,441	
1962/63	184,244	120,536	29,752	
1963/64	258,883	153,413	60,275	893
1964/65	329,883	173,694	87,493	829
1965/66	325,668	143,448	100,853	569
1966/67	357,395	156,371	127,735	836
1967/68	527,858	165,986	115,265	166,672
1968/69	748,741	219,587	166,705	267,011
1969/70	874,052	222,525	174,191	333,756
1970/71	927,668	199,511	175,963	343,248
1971/72	1,007,430	275,876	144,938	336,314
1972/73	1,173,528	324,621	168,759	440,277
1973/74	1,260,289	327,173	174,449	500,518

*Includes Highlands Ski Area

The actual use of each ski mountain in Aspen differs greatly, the number of skiers at Snowmass far exceeding those at Buttermilk and Aspen Mountain.[2] There is a significant difference in the average number of skiers per acre. Buttermilk has the greatest density followed by Snowmass and Aspen Mountain (Appendix C, Table I). This pattern of use can be largely attributed to the general type of terrain on each mountain. That is, Buttermilk has the greatest percentage of gentle terrain for novice skiers; such terrain is capable of handling higher densities than any other type of terrain. In contrast, Aspen Mountain attracts the majority of the advanced and expert skiers with its rugged terrain and is characterized by the lowest skier densities.

Actual ski use at Aspen also fluctuates throughout the season (Figure 6). On the basis of these fluctuations, the season is divided into six time periods:

1) November 27 - December 22
2) December 23 - January 4
3) January 5 - February 16
4) February 17 - February 28
5) March 1 - March 25
6) March 26 - April 14

Among each of the six time periods there is a highly significant variation in use with the exception of the time periods 2 and 3 (Appendix C, Table II).

The two lowest periods of use, 1 and 6, fall at the beginning and end of the ski season, times when use is traditionally low. It is generally thought that this is a result of poor snow conditions and good weather, permitting participation in a greater number of other outdoor recreational activities, especially at the end of the season. The extremely low use at the beginning of the 1973-74 season, compared to other years, can be attributed in part to usually poor snow conditions and the panic of the energy crisis.

Time period 3 has been characterized in the past by low use in Aspen; thus, the city introduced a winter festival, "Winterskol," and hotels reduced accommodation rates for group trips to promote tourist business. However, this year (1974-75) use during this time period seems to have risen dramatically, almost to that of time period 2, the Christmas holidays.[3] It follows that an increase in the number of group trips could explain this trend. Furthermore, it is interesting to note that use during time period 5, March, exceeds that of time period 2, the Christmas holidays, a time of peak use in the past. This situation, especially if it continues, might indicate that people are making conscious decisions to avoid the traditional Christmas crowd, or their large blocks of leisure time are being allocated at different time periods. However, the extreme peak days of use during Christmas should be acknowledged along with the general characteristics of average use. Finally, time period 4, the time of

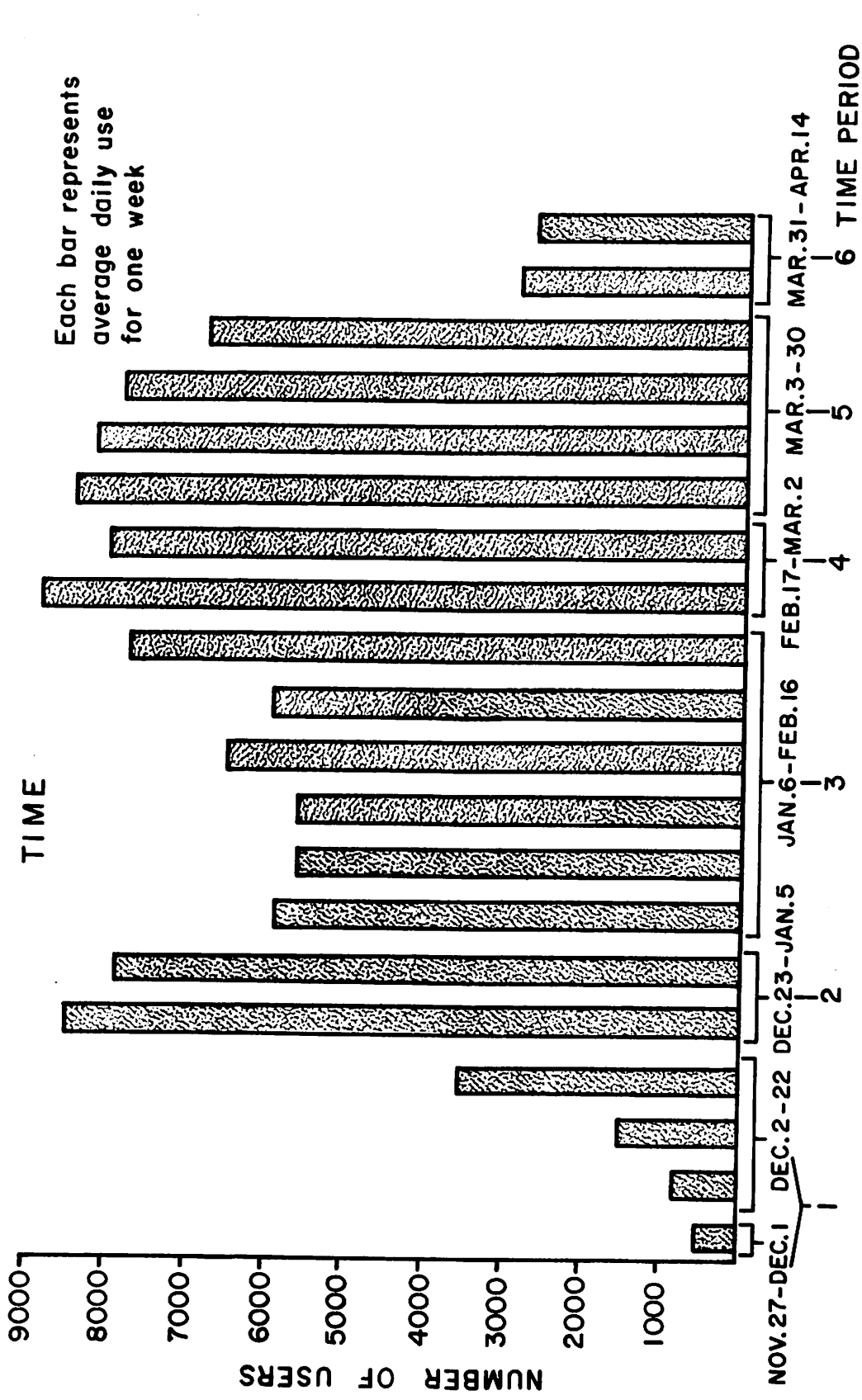

Figure 6. Skier Use for Aspen Mountain, Buttermilk, and Snowmass Ski Areas, 1973-74.

highest use falls on the Presidents' birthdays. This trend in use has also appeared in past years and is probably because of the long weekend vacation and the good weather and snow conditions typical of this time of year.

Significant fluctuations in use according to the day of the week were also noted. Unlike many Colorado ski areas, Aspen does not experience significantly greater use on weekends compared with weekdays; the opposite situation exists with significantly lower usage on Saturdays than any other day (Appendix C, Table III). Saturdays are probably consistently low because most hotels run accommodations for week blocks, starting and ending on Saturday, thus concentrating travel on that day.

Potential Use of the Ski Area

Along with actual use statistics, it is also important to recognize the physical potential use of the ski area. This potential use depends on lift capacity to a large extent; that is, how many people the lifts can accommodate in a given time period. Lift capacity is most critical during the time in which a large influx of people desire to ride to the top of the mountain, usually at the opening of lift facilities in the early morning.

The three mountains differ considerably in lift capacity (Table II) because of the difference in ski area and the time at which the facility was built. For example, Aspen Mountain, the first developed ski area, can only accommodate 1,500 people per hour, whereas Buttermilk can accommodate 2,000 people per hour. The situation at Snowmass is somewhat different since it has four separate ski areas. These areas, Elk Camp, Alpine Springs, the Burn, and the area under Sam's Knob or Campground, can carry a total of 4,970 people per hour. Therefore, in assessing the potential access lift capacity, assuming that there is an even distribution of people at the base lifts of each mountain, it can be concluded that facilities are best at Snowmass, followed by Buttermilk and Aspen Mountain. However, if the total ski area of each mountain is taken into account, access lift capacity is greater at Buttermilk than at Snowmass.[4]

By analyzing maximum lift capacity and area served by each lift, it is possible to estimate, in relative terms, whether there are too few or too many lifts serving an area (People/Hour/Acre Figures in Table II). For example, at Snowmass one would expect lines at lifts 4 and 10, and conversely crowded slopes serving lifts 1 and 6. However, in the latter case consideration must be given to the fact that these lifts mainly serve as access lifts; therefore, by controlling for these two lifts, lift 2 would fall as the most crowded. At Buttermilk the more crowded slopes would be those served by lift 1, whereas one is more likely to find lift lines at 2 and 4. Finally, the expected situation at Aspen Mountain would be crowded skiing situations for those

TABLE II

POTENTIAL USE OF EACH SKI AREA

Lift Number	Lift Capacity (People/hr.)	Area Served (Acres)	People/Hr./Acre
Aspen Mountain			
1A	1075	53.95	19.93
2	800	198.05	10.10
3	1200		
4	900	32.14	28.00
5	700	103.37	6.77
6	900	146.24	12.99
8	1000		
Total	6576	578.48	11.37
Access Lifts			
1A, 8, 2,	800		
4, 5, 3	700		
Total	1500	578.48	2.59
Buttermilk			
1	750	138.09	5.43
2	1000	43.84	22.81
3	850	63.37	13.41
4	1250	55.78	22.41
5	1200	--	--
1 and 4	2000	69.21	28.90
Total	5050	348.98	14.47
Access Lifts			
1 and 2	750		
4 and 5	1200		
Total	1950	348.98	5.59
Snowmass			
1	1200	20.66	58.05
2	1200	100.09	11.99
3	1200		
4	890	201.05	4.43
5	720		
6	1000	12.40	80.64
7	1200	104.45	11.49
8	1130	154.09	7.33
10	1100	186.18	5.91
11	1800	--	--

TABLE II (Continued)

Lift Number	Lift Capacity (People/hr.)	Area Served (Acres)	People/Hr./Acre
Snowmass (cont'd)			
3 and 5	1920	299.65	6.41
Bridge	--	20.39	--
Total	11440	1172.06	9.76
Access Lifts			
1,2,3, or 5	1950		
6,7,10	1000		
8,11	1130		
4	890		
Total	4970	1172.06	3.39

slopes serving lift 5 and lift lines at 4 and 1A. As in the case of Snowmass, the main functions of lifts 4 and 1A are access lifts; therefore, by excluding these lifts, lift lines at 6 and 8 might be the greatest problem areas. However, in all these cases caution is recommended in interpretation, and these results should only serve as general guidelines. Mere calculation of area and maximum lift capacity figures make many assumptions, such as conformity of types of terrain and distribution of slopes. In part, the statistics regarding crowded lift lines are substantiated by data obtained through the interviews in which waiting times in lift lines were recorded (Table III). These data indicate particular crowding problems at lift 3 on Aspen Mountain, lifts 2 and 4 at Snowmass, and none at Buttermilk. Therefore, estimates of lift line crowding from lift capacity and area figures hold partially true in the cases of Aspen Mountain and Snowmass.

Aspen's ratio of actual use to potential use is relatively low compared with most U.S. ski areas. The average use in terms of skiers per acre for each of the three mountains ranged from 2.9 to 3.6. It follows that the Aspen area does offer a relatively high quality ski experience in terms of congestion, or lack of it. However, the remaining unresolved issues concern whether any deterioration in quality is discernible at the present time and how this quality should be maintained in the future.

Factors Affecting Use

By examining some of the socioeconomic, demographic, and experience characteristics of skiers, it is possible to relate these statistics to the present nonparticipant population, the source of growth

TABLE III

LIFT LINE STATISTICS

Mountain	Lift Number	Number of Times Waited in Lift Line	Range of Time Waited in Line (min.)
Aspen	1A	1	10
	3	17	5-15
	4	5	5-15
	5	3	10
	6	4	5-10
	8	4	10
Buttermilk	1	2	10
	4	1	5
Snowmass	1	2	10
	2	10	5-15
	3	1	15
	4	7	5-15
	5	1	5
	8	2	10
	10	2	10

for skiing. Intervening events, such as weather and snow conditions, might have a significant effect on actual use.

Weather Conditions

Past research has linked people's general dissatisfaction in various recreation activities to adverse weather conditions. The level of this dissatisfaction seems to vary with the degree of commitment to participate in the recreational activity.[5] In the specific activity of snow skiing it seems likely that one should expect bad weather conditions because of the climate and need for snow. Despite this anticipation, it is generally hypothesized that bad weather in part would influence people's decision not to ski for the particular day.

In the analysis of weather's effect on daily use, the variables of temperature, wind, and snow were considered separately and in combinations. The overall results showed that each weather condition had little effect on use (Appendix C, Tables IV, V, VI). However, when considering the few cases recorded in the adverse weather group, the significance or lack of significance has little validity, although some variations in the pattern of use occur. For example, Buttermilk,

unlike the other two mountains, has greater use on days of bad weather conditions, such as when the temperature is below 10°F or when it is snowing. This use characteristic might be attributed to the gentle terrain at Buttermilk since people are more likely to ski less challenging slopes in bad weather. Conversely, Aspen Mountain has fewer skiers on snowy days and it is assumed that people avoid skiing difficult terrain under adverse weather conditions. When these weather variables are analyzed in combinations, similar results appear (Appendix C, Tables VII, VIII, IX). Again, Buttermilk shows greater usage on days when it is snowing and below 10°F (Appendix C, Table VIII), and with a combination of temperature below 20°F and wind speeds above 10 mph (Appendix C, Table IX).

In general, the lack of consistency in case numbers between groups makes it impossible to draw any substantial conclusions, positively or negatively. However, this problem in itself reflects an attractive characteristic of Aspen; that is, the large number of good weather days to enjoy skiing. Secondly, by generalizing the weather conditions for each day and not accounting for fluctuations during the day, results were somewhat biased. That is, behavior might be altered for only part of the day to avoid unpleasant weather. For example, extremely low temperatures in the morning might cause individuals to wait two hours before skiing, rather than forfeiting the entire day of skiing.

Snow Conditions

Adverse snow conditions are generally described as lack of snow and/or poor snow quality. The lack of snow, which in turn affects snow quality, appears usually at the beginning or the end of the season. Poor snow quality is likely at these same periods, but it can occur any time throughout the season. These snow quality aspects can be categorized by descriptions of general rating, actual snow conditions, and the amount of new snow (powder) in the daily snow reports. Good snow conditions are defined by the following characteristics: the rating is good, very good, or excellent; the snow conditions are packed powder or powder; and the new snow fall is one inch or greater. Poor snow conditions are defined by a poor or fair rating, hard-packed, wind-packed, or granular snow conditions, and little or no new snow (Appendix C, Tables X, XI, XII).

As in the case of weather, there are very few days in Aspen where there are poor snow conditions and ratings. Therefore, case numbers in these categories and significance levels have little meaning. Nevertheless, average use is lower on each mountain when ratings and snow conditions are reported as poor (Appendix C, Tables X, XI). For new snow the number of cases in each group is adequate for analysis. Aspen Mountain is the only place receiving a significantly higher usage when there was a greater amount of new snow. This points to the fact that Aspen Mountain's difficult terrain attracts a greater number of people when new snow accumulation exceeds one inch.

It is difficult to project the effect of snow conditions on present and/or future use. The problem relates to the timing of poor snow conditions at the beginning and end of the ski season. That is, there could be other variables affecting usage at these times. For instance, traditionally low usage in itself might condition people to think that these are not optimum times to ski, and the availability of other outdoor recreational activities because of warmer weather might be a factor. Nevertheless, it is felt that snow conditions have an important effect on the decision to make the ski trip at any given time period.

Characteristics of Users

Certain socioeconomic, demographic, residency, and past experience characteristics of users are considered as determinants of participation in skiing. It is generally hypothesized that these types of characteristics for those who ski at Aspen will differ in some respects from skiers at other areas. Aspen is relatively remote in location and expensive, not only for skiing but also for accommodations and restaurants, as compared with other areas.

Even though nearly half the skiers were skiing at Aspen for the first time, a very small percentage (7.6 percent) were on skis for the first time (Appendix C, Tables XIII and XIV). In fact, a majority of the people skiing in Aspen had from two to five years of experience. This indicates that Aspen mainly attracts skiers with some experience, although such experience was not necessarily gained at Aspen itself. However, over half of the respondents had skied Aspen more than once, 6.3 percent had made two or more trips during one season, and 29.1 percent stated they returned to Aspen because of past experience. It follows that a significant number of skiers feel that their past experience in the area had been satisfactory. This satisfaction can be related to several amenities in the area, such as the town, the skiing in general, and the variety, area, and relative lack of congestion in skiing (Appendix C, Table XV).

Only 41.9 percent of the interviewees were active in other outdoor winter sports. Alpine skiing does not seem to motivate a majority of people to participate in other outdoor winter sports. Of those who did participate, ice skating and cross-country skiing were the most frequent with 64.7 and 36.6 percent participation, respectively. The percentage of cross-country skiers is noteworthy, since it is similar to alpine skiing and in the future could serve as a substitute to alpine skiing.

Approximately half of the skiers stayed one week in Aspen, whereas only 9.5 percent came for the weekend (Appendix C, Table XVI). This supports the statistics concerning fluctuations in actual use and strengthens the conclusion that Aspen is not a weekend ski area. It is probable that the time and cost of traveling to Aspen warrants at least a week's stay. In addition, this evidence demonstrates that Aspen restricts its tourist population to those who have large blocks of leisure time in order to make the trip.

It is hypothesized that visitors to Aspen are even a more select group according to their socioeconomic and demographic characteristics. It was found that a majority of the skiers are male (68.2 percent), single (60.7 percent), and between the ages of eighteen and thirty-five (69.5 perdent) (Appendix C, Table XVII). These characteristics agree with those for Colorado skiers as a group and generally for all skiers. Moreover, Aspen skiers have a high level of education with over half completing college or some postgraduate work (Appendix C, Table XVIII). The majority hold professional and technical positions (Appendix III, Table XIX), and have a very high level of income with 35 percent earning over $25,000 annually, a level much higher than most Colorado skiers.[6] Aspen residents earned significantly less than non-resident skiers (Appendix C, Tables XIX and XX).

The permanent place of residence for skiers in Aspen differed considerably from skiers of other Colorado areas. Of the respondents, 18.6 percent were Aspen residents and only 10 percent from other areas in Colorado. This points to the fact that Aspen attracts a majority of its skiing population from out-of-state locations,[7] especially the midwest, west, and northeast regions of the country. In addition, the time at which the individuals from each region chose to ski differed significantly. For example, more skiers came from the Northeast during January and March, and from the mid-Atlantic region during February. If people were not able to ski by January, they might choose to ski in another part of the country where snow conditions were reliably good. In contrast, a consistently high percentage of skiers came from the Midwest throughout the season, whereas most of the skiers from the South and Southwest came during December, January, and the first part of February. It is difficult to explain why these particular patterns of use appear and some consistency in future use would have to be established to substantiate reasons (Appendix C, Table XXI).

The majority of skiers in Aspen came from metropolitan areas of over one million population (Appendix C, Table XXII), especially from Chicago (13.7%), New York City (9.2%), Denver (6.0%), and Detroit (4.5%). The metropolitan origins of Aspen skiers generally supports the "new experience" rather than the familiarity theory in recreation in which people seek leisure time experiences that allow them to escape their everyday surroundings via sharply contrasting environments and experience.[8]

Past research has shown that childhood participation in certain outdoor recreation activities is a significant determinant of adult participation in those same activities. This stems from the "pleasant childhood memory" concept in which activities pleasantly familiar in childhood have an attraction during adulthood.[9] However, at present it is hypothesized that childhood experience is not a major factor affecting participation in snow skiing because of the recent greater availability of the sport resulting from large scale development. In this case study, even though 73.4 percent of the skiers had some immediate family member that skied presently, only 36.4 percent had

parents that had skied at any time. It follows that these family members for the most part are in the same peer group as the individual or younger. Also, only 11.2 percent of the present skier population were below eighteen years of age and 34.4 percent had skied before the age of fifteen. Therefore, it seems clear that not enough people have been exposed to the sport as children to account for the present adult participation.

This situation could change rapidly with time since those individuals entering into child-bearing age could introduce the sport, as parents, to a much greater portion of the future childhood population. In this case study, those between the ages of eighteen and twenty-five accounted for 36.0 percent of the skiing population but only 0.8 percent of this group have children that ski. In contrast, 30.5 percent of the age group from twenty-six to thirty-five have children that ski (Appendix C, Tables XVII and XXIII). It follows that as the eighteen to twenty-five year group ages, many more children will be introduced to skiing. The high participation rate among adults, when coupled with the future effects of life cycle determinants, will probably cause a great increase in demand in the future.

In summary, Aspen skiers tend to be disproportionately drawn from the age group of eighteen to thirty-five, from high education ranks, from professional and technical occupational groups, and from large metropolitan areas outside the State of Colorado. They also have high incomes and large blocks of leisure time. These same characteristics are found in a steadily increasing portion of the population. Moreover, if the same percentage of first time skiers return to Aspen as in the past, there will be a guaranteed 22 percent increase. Finally, with the possibility of life cycle determinants taking effect in the next few years, it is assured that skiing here will not only be comprised of a greater portion of children, but also an increasing portion of the adult population will continue to ski. Therefore, there is a high probability of marked increase in use of the Aspen ski area in the future.

Chapter II References

1. Charles R. Goeldner, Karen P. Dicke, and Gerald L. Allen, Colorado Ski and Winter Recreation Statistics, 1972 (Boulder: University of Colorado Press, 1972), pp. 2, 22.

2. Actual use statistics, provided by the Aspen Skiing Corporation, account for only those tickets which are punched daily. Therefore, season and complimentary passes are not included in these figures.

3. The percentage of rise in ticket sales during January over last year was forty-nine percent. There is no significant difference between time periods 2 and 3.

4. Capacity figures on access lifts are restrained by that lift with the lowest capacity. Total area in relation to capacity is obtained by dividing the lift capacity by the total area.

5. Outdoor Recreation Resources Review Commission, The Quality of Outdoor Recreation: As Evidenced by User Satisfaction, Report No. 5 (Washington, D.C.: Government Printing Office, 1962), pp. 32-38; Robert A. Adams, "Weather, Weather Information and Outdoor Recreation Decisions: Study of the New England Beach Trip" (unpublished Ph.D. dissertation, Clark University, 1971).

6. In the entire state of Colorado, skiers are described by the following characteristics: 66.3 percent are male, 57.5 percent are single, 50.0 percent are between the ages of twenty and thirty-four, 41.8 percent have completed college or some postgraduate work, and 13.5 percent have an annual income over $25,000. (Charles R. Goeldner et al., Colorado Ski and Winter Recreation Statistics, 1972, pp. 12-14.) For skiers in the entire United States, men and higher educated individuals are the greatest participants, and participation peaks between the ages of eighteen and twenty-four (Outdoor Recreation Resources Review Commission, Participation in Outdoor Recreation: Factors Affecting Demand, Report No. 20 (Washington, D.C.: Government Printing Office, 1962), pp. 14-25).

7. For all of the ski areas in Colorado, 64.9 percent of the skiers were from the state (Charles R. Goeldner et al, Colorado Ski and Winter Recreation Statistics, 1972, p. 95).

8. John Hendee, "Rural-Urban Differences Reflected in Outdoor Recreation Participation," Journal of Leisure Research, I (Autumn, 1964), p. 337.

9. Outdoor Recreation Resources Review Commission, Participation in Outdoor Recreation: Factors Affecting Demand, p. 23; Dean B. Yesting and Frank Burkhead, "Significance of Childhood Recreation

Experience on Adult Leisure Behavior: An Explanatory Analysis," Journal of Leisure Research, V (Winter, 1973), pp. 25-36; Andrew J. Sofranko and Michael F. Nolan, "Early Life Experiences and Adult Sports Participation," Journal of Leisure Research, IV (Winter, 1972), pp. 6-18; John Hendee, "Rural-Urban Differences Reflected in Outdoor Recreation Participation," p. 333-341.

CHAPTER III

USER EVALUATION OF SKIER DENSITY

It is generally agreed upon that resources are defined by human perception.[1] Resource perception has particular importance in recreation because of the personal and subjective way in which the resources are used. Thus, the organizing concept of this chapter is the way in which skiers perceive and subsequently evaluate the use of the resource. The analysis of their evaluation of use should indicate levels of desired use.

In particular, the attitude toward use of the Aspen ski area is measured by the user's evaluation of the "number and distribution" of people skiing. Thus, evaluation of use in these terms is a function of the skier's need for space, his territoriality. The user scales his answers on a card as shown on Figure 7.

Skiers are also asked to evaluate their feelings toward the "number" of people skiing in the relative terms of many or few with the same scaling technique. As expected, these two measurements of attitudes toward use highly correlate with an r value of .56, statistically significant at the .001 level. Therefore, it is clear that if people sense congestion, they believe too many people are skiing. However, throughout the following analysis only the scale which measures the attitudes toward the "number and distribution" of people skiing is used, since it is the scale reflecting relative density.

Responses to the question of the skier's evaluation of use are correlated with spatial, temporal, and physical variables and user characteristics. In addition, skiers are asked to evaluate the use of facilities and the maintenance of facilities and ski slopes. Their evaluations are reflected by the respondent's request for a change or for expansion of specific facilities and in aspects of maintenance.

Location: Variations in Skiers' Evaluations of Use

Skiers' evaluations of use on each of the three mountains vary significantly and differ considerably from actual use statistics (Appendix D, Table I). For example, even though Buttermilk has the greatest number of skiers per acre, skiers believe use is the lowest here of all three mountains. Likewise, skiers believe that Aspen

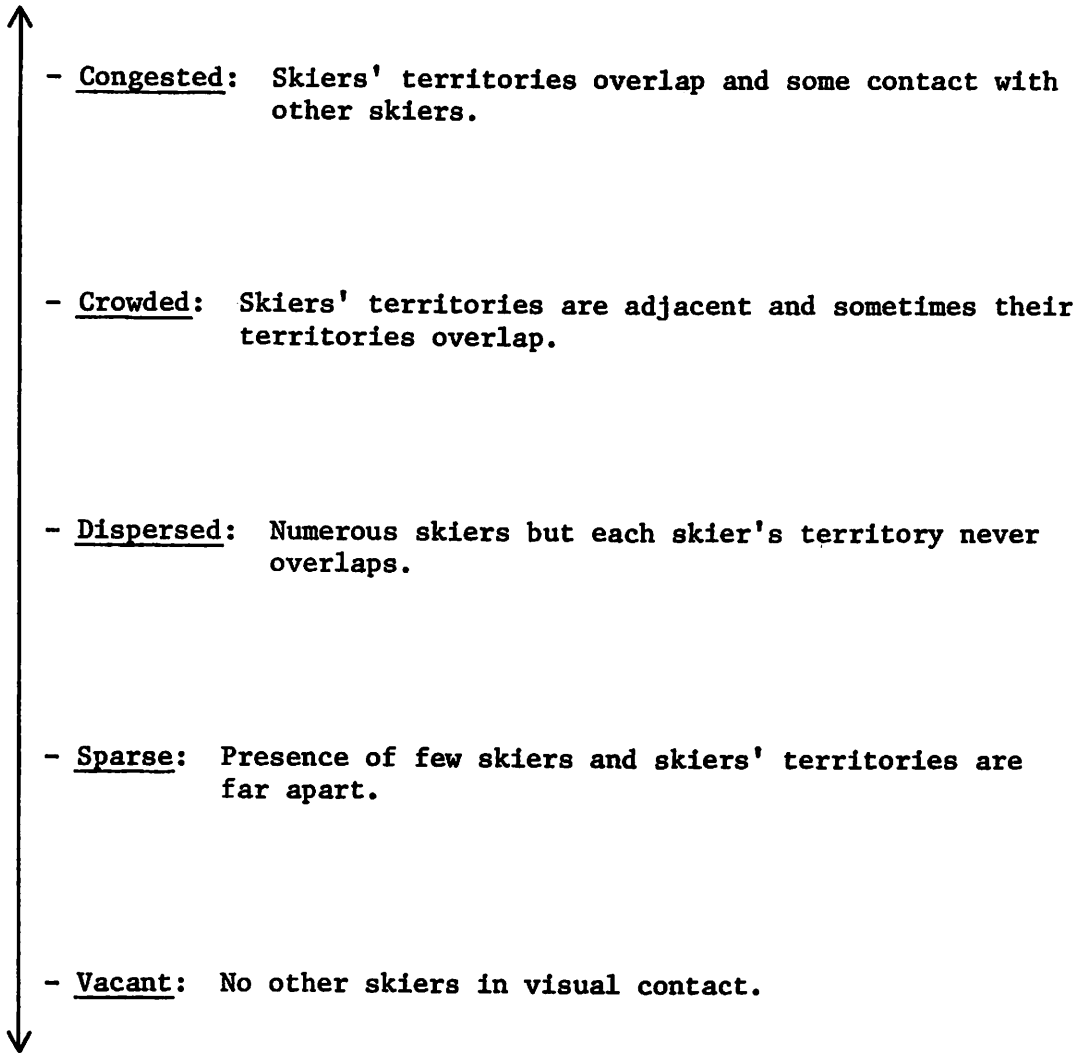

Figure 7. The respondent's evaluation of the number and distribution of people skiing.

Mountain is the most congested, even though actual density here is the lowest of the three mountains. These differences are explained by and point to the importance of the type of terrain affecting the carrying capacity. That is, the expert terrain of Aspen Mountain can accommodate a significantly lower number of people than the gentle terrain of Buttermilk. It is important to mention the description of the evaluation of use at each mountain. On the average, skiers feel use at Buttermilk is between sparse and dispersed. At Snowmass and Aspen Mountain skiers' evaluations of use are slightly below and above dispersed, respectively. This reflects a situation in which crowded conditions are not consistently present, and skiers should be generally satisfied.

Further analysis shows that skiers do not feel that use is significantly different at the lifts on each mountain (Appendix D, Table II). This, in part, is explained by the way in which the question regarding use is worded. Respondents in this survey are asked for the usage evaluation of their total skiing experience for the day; therefore, their skiing experience is not assumed to be confined to the area serving the lift at which they are interviewed. However, it is interesting to note the variations in evaluations of use at Snowmass, even though the analysis is statistically significant only at the .07 level. By combining the lifts at Snowmass, variations in skiers' evaluations of use are demonstrated by area rather than by lift. Skiers feel that the areas receiving the highest use are Alpine Springs (lifts 8 and 11) and the area under Sam's Knob (lifts 1, 2, and 3). Conversely, they believe that use is lower at the Burn (lift 4). Campground (lift 5), and Elk Camp (lifts 6, 7, and 10). In part, these variations are explained by discrepancies in the area served by each lift. The area under Sam's Knob is less than that of the Burn, Elk Camp, or Campground. In addition, the area under lifts 1 and 2 serves as the only access to Snowmass Village and one of the main routes to transportation facilities and parking lots. Therefore, a situation is created in which all skiers at Snowmass filter into this area, especially at the end of the day. On the other hand, the lower evaluations of use at Campground, the Burn, and Elk Camp each can be attributed to different explanations relating to actual use. It seems that Snowmass might attract fewer advanced skiers; therefore, use at Campground is relatively low. Secondly, lift 4 serves the greatest area of any lift on the mountain which in turn limits the number of skiers per acre. The remoteness of Elk Camp to base facilities causes people to remain completely unaware of the existence of the area or access to the area. Finally, these explanations regarding the discrepancies in the evaluation of use suggest that redistribution of skiers is called for through information dispersal.

Time: Variations in Skiers' Evaluations of Use

Skiers' evaluations of use are analyzed in a time framework by using the same time categories determined by fluctuations in actual use throughout the season. The skiers feel use is significantly different among the six time periods (Appendix D, Table III). However, the variation in the skier's evaluation of use does not coincide exactly with the variation in actual use.

Skiers feel use is lowest at the beginning of the season. This follows since the lowest actual use occurs in the same time category. The end of the season, time period 6, also receives significantly lower actual use than the rest of the season. However, skiers do not feel that use during this time period is lower than use during time periods 2 and 3. The difference between skiers' evaluations of use and actual use in part is explained by the fact that data pertaining to skiers' evaluations of use were not obtained for the last two thirds of time period 6, the time when actual use had dropped drastically. Skiers also judge use as being more congested during time period 3, January, than during time period 2, the Christmas holidays. This further demonstrates the rise in use during the traditional nonholiday season.

Skiers do not believe that use varies significantly from January to the end of the season. However, the arithmetic means of the skiers' evaluations of use are the highest from mid-February through most of March (time period 4 through 5), times of highest actual use. Generally, it seems that skiers' evaluations of use are a function of actual use, even though they do not vary as greatly as actual use. Moreover, it must be understood that skiers' evaluations of high use are characteristic of dispersed rather than crowded conditions.

Further analysis reveals that skiers believe use is significantly different among these time periods only at Snowmass. Skiers evaluate use fairly consistently throughout the season at Aspen Mountain. However, the absence of information at the beginning of the season because of poor snow conditions not permitting skiing here may be a direct cause of the nonsignificance. In addition, skiers think Aspen Mountain is crowded during time period 4, mid-February. This appears during a time when season passes may not be used on the mountain.[2] Therefore, the combination of actual use statistics and skiers' evaluations of use indicate definite potential crowding problems during this time for Aspen Mountain.

The situation at Snowmass reveals that skiers believe use is lowest at the beginning of the season, as expected. However, they do not feel that use during this time period differs significantly from use during time periods 6, 4, and 2. Skiers judge the highest levels of use (at an average level of "dispersed") during time periods 3 and 5. Although variations here differ significantly, skiers' evaluations of use are close to actual use with the exception of time period one.[3]

Finally, skiers judge use at Buttermilk as being between sparse and dispersed throughout the season. This area, therefore, seems to have no crowding problems.

Further analysis shows that skiers' evaluations of use vary significantly according to the day of the week (Appendix D, Table IV). Skiers believe the day with the lowest is Saturday. Actual use is indeed significantly lower on this day. Skiers evaluate use significantly differently according to time of day (Appendix D, Table V). Skiers believe use is lower during the first hour of skiing which is a result of the relatively low density of skiers. The low density is probably caused by the time lag necessary to transport people up the mountain, people avoiding lower temperatures characteristic of the early morning, or people feeling that a full day of skiing can be accomplished without starting at the opening of the lifts. Conversely, skiers believe use is highest during the last two hours of the day, a time when people are finishing skiing for the day. Their sense of crowding is understandable, since skiers tend to accumulate on access ways to the bottom and on the lower slopes.

Weather and Snow Conditions: Variations in Skiers' Evaluations of Use

Skiers feel less congestion on the slopes when they are skiing under certain adverse weather or snow conditions (Appendix D, Table VI). This is probably a direct result of actual lower use on the ski slopes. For example, in the two cases when the temperature is less than 10°F or when it is snowing and winds are greater than 10 mph, skiers judge use as being significantly lower at the .05 level. In the case of low temperatures it seems probable that people delay skiing during the early morning hours when temperatures are lowest. They know that they are able to ski a "full" day by going later. In the second case of high winds and snow, it is thought that people either do not ski at all or they retreat to restaurants on the mountain. Similar to this weather circumstance is the one of snow and low temperatures. Skiers judge use considerably lower under this adverse condition; however, the low number of cases precludes statistical evaluation.

Peoples' skiing does not seem affected by the three conditions of high winds, snowing conditions, or the combination of low temperatures and high winds. It seems reasonable to assume that high winds are neither consistent nor characteristic of any one area throughout a full day. Therefore, people are able to escape winds by skiing in another area or waiting for a short time until the winds die down. Unless winds are extraordinarily high, it is generally apparent that winds do not affect actual use, and in turn, skiers' evaluations of use. Snow, when temperatures are above 10°F and winds are less than 10 mph, is a weather condition which is probably anticipated by a great number of skiers. Therefore, if they expect snow and equip themselves

accordingly, it follows that less dissonance will be created, and that they would ski.

As in the case of weather conditions, adverse snow conditions seem to affect the skiers' evaluations of use (Appendix D, Table VII). This is attributed to actual lower use occurring at the beginning of the season. On all mountains, skiers believe use is lower when there are generally poor snow condition ratings and minimal snow base. The only exception to this base is Aspen Mountain which was not open when poor snow conditions were prevalent. On the other hand, adverse daily snow condition reports did not significantly affect the skiers' evaluations of use (Appendix D, Table VII). Unlike snow condition ratings and minimal snow base, actual snow conditions can vary throughout the season. This points to the fact that poor snow conditions at the beginning of the season seem to be a factor in causing people to avoid skiing completely. Conversely, when unpredicted short-term periods of poor snow conditions appear throughout the rest of the season it is not a significant factor in the decision to ski.

It seems clear, assuming here that skiers' judgment of use intensity is a function of actual use, that those significant characteristics of adverse weather and snow conditions can serve as predictive factors in actual future use. Furthermore, the analysis of skiers' evaluations of use shows a greater amount of variation than analysis of actual use in examining the effects of weather and snow conditions (Chapter II). This is a direct result of more accurate data collection. Specifically, data are gathered for all times of a skiing day, instead of one set of data for the entire day.

User Characteristics Affecting Evaluations of Use

Analysis in Chapter II revealed that present and future skier populations in Aspen have certain socioeconomic, demographic, and residency characteristics and past recreational experiences. Thus, the question arises as to what significant correlations are found between those predominant characteristics and high or low evaluations of use.

Socioeconomic, Demographic, and Residency Variables

Little research has been conducted in regard to crowding and population characteristics. It has been shown that under conditions of limited space that more stress is experienced by males than by females and under competitive rather than group situations.[4] In this particular study, very small differences in evaluations of use are detected among user characteristics. Age is the only significant variable that can be related to the skier's judgment of crowding, whereas sex, marital status, income, education, occupation, and residency cannot (Appendix E, Tables I-VI). This leads to several hypotheses, the most plausible of which is that the crowding situation on the ski slopes is not great enough to allow detection of significant variations among user characteristics. A second consideration centers around the nature of the specific activity in the given amount of space. That is, skiing as

a recreational, not a competitive, activity might not create a stressful atmosphere as quickly as other recreational or everyday working activities.

Evidence suggests that downhill skiers with high levels of education, occupational status, and income are not necessarily motivated to avoid overcrowded slopes in favor of more remote pristine areas. These findings directly oppose those in wilderness recreation.[5] Thus, it seems that skiing in vast open spaces is not a high priority goal, unlike wilderness recreation, or people are conditioned not to expect it.

In addition, the statistically significant difference at the .005 level in the evaluation of use and ages of skiers is the reverse of that in wilderness users. In skiing, those under the age of thirty rather than those over the age of thirty sense crowding at lower densities. Both experience and conditioning could explain this finding. That is, the older and more experienced one becomes in skiing, the more he is exposed to and comes to expect a greater number of people skiing. Conversely, the younger person is apt to be the one to ski expert terrain at a high speed, which requires much space. These facts also indicate that value judgments toward the sport might differ with age. Specifically, the younger people are more concerned with the quality of the recreation experience, whereas the older people might value not only the skiing, but also the entire set of events and circumstances centered around the activity, such as entertainment and socializing. Finally, the younger person's need for more space in skiing could possibly exist in many types of recreation and working situations.

Residency variables, like most socioeconomic and demographic variables, do not account for any differences in evaluation of use (Appendix E, Tables VII and VIII). Explanations for the nonsignificance in the two cases of permanent and part-time Aspen residents could relate to familiarity with the ski slopes. It was first hypothesized that these residents who are conditioned to past situations of low density skiing would sense crowding at lower use levels. However, this situation might have been counterbalanced by the same familiarity in that the Aspen residents know where the least crowded areas are to ski during generally crowded times. Thus, their evaluation of use is lower or approximately the same as nonresident skiers.

The appearance of the nonsignificant difference, when testing Colorado residency, in part can be attributed to the remoteness of Aspen to Colorado residents. The relatively low percentage of Colorado skiers here reflects the unfamiliarity and possible inaccessibility of the area to most Coloradans. It seems that familiarity and accessibility are approximately the same for both Colorado and non-Colorado residents. It follows that expectations and evaluations of use would be, and in fact are, similar among the two groups. Moreover, these results indicate that the numerous ski areas and experiences

offered to the Colorado resident have no bearing on skiers' judgments of use on the Aspen slopes.

Finally, no significant difference is found among levels or urbanization and evaluation of use. Thus, population densities surrounding the skier's permanent living and working conditions do not influence his sensitivity to crowding on the Aspen ski slopes. This suggests that both urban and rural residents skiing here are similarly affected by population densities. The most credible explanation is that densities on the Aspen slopes are not great enough to allow the detection of differences in evaluations of use according to levels of urbanization.

Present and Past User Experiences

It is generally believed that an individual's present and past experience in a recreational activity, especially those acquired at a young age, will increase his awareness of the circumstances surrounding the activity necessary to obtain optimum satisfaction.[6] It is hypothesized that greater involvement in past and present skiing experiences and activities creates the specific need for a lower skier density situation.

Cost, travel, and anticipation of crowding are immediate experiences preceding skiing which might affect the evaluation of use (Appendix E, Table IX). First, the skier density levels anticipated by the individual and the evaluation of use at the time of skiing significantly correlates with the r value equal to .39. This is understandable, since the anticipated level is probably based on previous experience or reliable hearsay. However, only 32.9 percent of the respondents said they actually thought about how many people would be skiing for the day in Aspen. This percentage generally reflects the low importance of skier densities in the anticipation phase and decision-making process to ski on a particular day in Aspen. This may stem from the fact that the majority of people travel long distances and stay for at least one week with the primary intention of skiing, regardless of intervening variables, such as crowding. Secondly, neither cost (r value equal to .005) nor miles traveled appear as significant variables in relation to skiers' evaluations of use. This demonstrates that the individual who considers his stay in Aspen expensive or travels relatively long distances does not feel crowded at lower densities. The nonsignificance indicates that cost in terms of dollars and time spent in travel is not a predictive factor in skiers' evaluations of use, or that crowding has not reached a significant level to become sensitive to such variables.

Among those characteristics describing present involvement in skiing, technical skiing ability is the only variable sensitive to differences in evaluation of use (Appendix E, Tables X-XIII). In this specific case, the more advanced skiers rather than novice or intermediate skiers feel that conditions become crowded at a lower density. This is because it is more difficult to avoid other skiers when one is skiing relatively fast and on rugged terrain suitable only for advanced skiers.

Membership in a ski club, type of lift ticket, and size of party with which the individual is skiing are not significant factors in accounting for differences in evaluation of use. Membership in a ski club is unlike a wilderness group in terms of concern for the quality of environment. That is, the main function of a ski club is coordinating group ski trips. The nonsignificance in this case further strengthens the belief that the ski club serves strictly as a social rather than an environmental organization. However, the importance of social interaction regarding differences in evaluation of use does not extend as far as the size of party with which the individual is skiing. It was first hypothesized that the larger the skiing group, the less the individual would be concerned with skiing conditions, such as crowding, and the greater would be the importance of social group interaction. The nonsignificance in this case indicates that individual skiing groups are not large enough to crowd the slopes and that possibly the significance of social interaction lessens considerably once actual skiing commences.

In the case of type of lift ticket it was hypothesized that season pass holders would sense crowding at lower densities, since these individuals probably ski more frequently, thus increasing familiarity and experience. However, it seems that evaluation of use is approximately the same regardless of a season or daily type pass. On the average, the season pass holder evaluates use at a lower level than the daily pass holder, although the difference is not statistically different. This result is similar to the case of Aspen residency. Since most of the season pass holders are permanent or part-time residents of Aspen, similar conclusions are drawn. That is, these individuals have knowledge of and ski the least crowded areas; this tends to equalize their sense of crowding with that of the nonresident skier who purchases daily ski passes. Another factor is that season pass holders are excluded from skiing the most crowded area, Aspen Mountain, during time period 4. This circumstance probably contributes to their over-all lower evaluation of use.

Apart from skiing, those participating in other winter sports at the present time sense crowding at a significantly lower density than those who do not participate (Appendix E, Table XIV).[7] Since low population densities characterize most winter sports, it follows that participation in these sports conditions the individual to expect low densities on ski slopes. However, in the winter sports of ice skating and snowmobiling high densities are sometimes characteristic. When excluding these two sports in testing, participation in winter sports again is associated with significantly higher evaluations of skier use. Those participating in cross-country skiing feel crowding at a significantly lower density than the rest of the population. This result reflects the low density characteristic of cross-country skiing and its effect on the evaluation of use in alpine skiing.

The last category of the user's experiences and activities deals with those accumulated in the past (Appendix E, Tables XV-XVII).

Generally, total years skied by the individual did not significantly affect the skier's evaluation of use. However, it is interesting to note that arithmetic means of skiers' judgments of density does increase as the total years skied increases. Assuming that this pattern is reliable, the variable probably will become significant under more crowded conditions. In addition, similar results and patterns of means appear when considering total years and days skied this season in Aspen. These results demonstrate that experience, in general, and familiarity with Aspen, in particular, do not affect the skier's judgment of use. It is thought that the lack of crowded conditions accounts for this, especially when considering the consistent pattern among the average of skiers' evaluations of use.

Skiing in specific areas of the country characteristic of high density skier populations does not affect the skier's evaluation of use in Aspen (Appendix E, Tables XVIII and XIX). It is hypothesized that those people who had skied in the Northeast, Midwest, or California had probably experienced higher skier densities than those found in Aspen. It follows that these experiences would lead to a tolerance of higher densities and a higher level of use at which crowding is detected in Aspen. However, these statistics do not support the hypothesis that past experiences of this type have an effect on the evaluation of use in Aspen. A primary consideration in interpretation of these results is that past experiences were not great enough, especially if the individual had only skied the area once, to have an impact. In part, this is taken into consideration by testing the area of the country where most of the skier's experiences had taken place. Again, those individuals who had done a majority of their skiing in the Northeast, Midwest, or California do not sense crowding at a significantly higher level of use in Aspen. Results from both tests indicate that these past experiences do not affect evaluation of use in Aspen. It seems that past and present experiences related to Aspen have greater influence than those acquired in other places at some past time.

Finally, if the respondent's parents skied, he feels crowding at a significantly lower level of use than those who did not have parents that skied (Appendix E, Table XX). This stands to reason, since those with parents that skied probably have greater experience and exposure to skiing. It is also possible that these individuals skied at a time when skier densities were much lower than today. These results generally point to the importance of life cycle characteristics in the evaluation of skier use.

Motivations

It is generally agreed that recreation is as much a psychological experience as it is a physiological one. That is, humans are motivated to pursue certain recreational activities to fulfill psychological needs

and aspirations. When these needs are met through the recreational experience, the individual has obtained satisfaction which in turn can be evaluated in terms of real benefits.[8]

In this study several motivations and their relation to the skier's evaluation of use are examined. Since crowding sometimes acts as an intervening variable, the individual may be unable to fulfill his motivations. Where the motivation to ski for physical exercise, challenge, or enjoying outdoor surroundings is high, the existence of crowds impedes user satisfaction. It follows that these types of individuals are concerned about skier density and will probably sense crowding at lower densities. On the other hand, those individuals highly motivated to ski for social reasons, such as being with family or friends, meeting new peopoe, enjoyment of après ski entertainment, or because skiing is currently a popular sport, are less concerned about crowded conditions on the slopes. They would sense crowding at higher densities, since crowds would not hinder user satisfaction.

Statistical results of the above motivations and the evaluation of use show very little correlation (Appendix E, Table XXI). This is probably a result of unreliable questions for determining motivations. It is felt that the categories of motivations used in the questionnaire are too broad to be sensitive to evaluation of use. This is further substantiated by the majority of low nondiscriminant correlation values among this set of motivational factors (Appendix E, Table XXII). For example, the four motivations considered as social reasons to ski do not highly correlate among themselves nor do they differ between the motivations of challenge, physical exercise, or natural amenity experience. These results point to the complexity of the role of motivations, or the possibility that motivational theory in determining user satisfaction has no validity. In this case, it is felt that the statistics should not be interpreted in a manner which would negate the relationship between these two factors, but rather in a manner which would call for more detailed data collection and analysis.

Resource Quality Affecting Skiers' Evaluations of Use

It is generally hypothesized that the evaluation of resource quality, such as natural snow and slope conditions, facilities, and maintenance affects the skier's judgment of use on the slopes. An improvement in resource quality raises the level at which crowding is first sensed. Thus, the skier's evaluation of use varies directly with his evaluation of resource quality. It is also felt that ski and related facilities become crowded before crowding occurs on the slopes. Therefore, quality deterioration begins with facilities and maintenance and in turn induces crowded conditions on the slopes which affects the skiing experience.

Skiers were asked to evaluate their feelings about natural conditions and general maintenance and to acknowledge any requests for a

change in specific facilities and maintenance. In the latter case, a request for a change is an indicator of present inadequacy, and a lack of knowledge reflects unawareness or inexperience in the matter. In general, facilities and maintenance seem adequate in the Aspen area (Figures 8A and 8B). The range for a requested change is from 1.8 percent, number of attendants at lift lines, to 27.5 percent, parking facilities.

There is also a high percentage of responses indicating no knowledge regarding ski instructors and patrol. This reflects the low percentage of skiers who take ski lessons, and the high degree of unawareness or little contact with the ski patrol. However, the groups which had some experience with ski instructors or patrol seem well satisfied. The skier population has relatively few complaints regarding the lift attendants and the ticket attendants. Congestion at ticket sales appears more at Aspen and Snowmass mountains, 16.3 and 16.1 percent complaints, respectively, whereas at Buttermilk only 8.4 percent of those interviewed request a change in the number of ticket salesmen.

In one aspect of maintenance, grooming of the slopes, 85.5 percent of skiers call for no change. Those who want a change are mostly skiers at Aspen Mountain, 14.5 percent, and Snowmass, 17.2 percent. However, the types of changes requested in grooming are highly conflicting at these two areas with some wanting more and others less grooming (Table IV). Both the low percentage of those wanting a change and the lack of agreement on types of changes demonstrates present adequacy and no call for a change.

TABLE IV

TYPES OF GROOMING CHANGES REQUESTED
(PERCENT RESPONSES)

Change	Aspen Mountain	Buttermilk	Snowmass
Quality Improv.	15.8	0	14.3
Less	36.8	16.7	46.4
More	47.4	83.3	39.3

Changes in the facilities directly associated with skiing. such as chair lifts, parking, and mountain restaurants, are most often requested. In the case of chair lifts, the responses vary significantly within the six-period time framework (Appendix F, Table I). The largest number of requests for more chair lifts appears during time periods 5 and 6, the month of March, whereas the lowest appears during time period 1, Thanksgiving until Christmas. The positive response

varies at each mountain with 31.5 percent at Aspen Mountain, 24.8 percent at Snowmass, and only 7.7 percent at Buttermilk. Furthermore, the responses do not differ significantly at Aspen Mountain or Buttermilk but do differ significantly at Snowmass during the time framework (Appendix F, Table II). Specifically, at Snowmass skiers feel a need for more chair lifts during time periods 4 and 5, mid-February through March. These data point to the fact that Aspen Mountain and Snowmass during the time period 4 and 5 are areas of most crowded chair lift facilities. However, the percentages do reveal that the situation has not reached a problem level.

The case of mountain restaurant facilities, 20.2 percent of the skiers want some kind of change. These requests do not significantly differ among time periods. However, they do vary according to the specific mountain. For instance, 33.5 percent of the skiers interviewed at Aspen Mountain request restaurant facility changes as compared with 20.5 percent at Buttermilk and 16.4 percent at Snowmass (Appendix F, Table III). At Aspen Mountain the majority of skiers, 81.0 percent, want more restaurants or the expansion of existing ones, whereas at Buttermilk and Snowmass approximately half the skiers want more restaurants and the other half want changes in price or food quality. Therefore, it seems that the only problem in restaurant facilities relates to crowded ones on Aspen Mountain.

Parking facilities seem to be the greatest problem at Aspen presently with 27.5 percent of those interviewed desiring more space. Moreover, when discounting the 26.2 percent of the skiers who are unfamiliar with parking accommodations, the request for more parking rises to 37.2 percent. The responses differ significantly among time periods and locations (Appendix F, Table IV). The largest number of requests for more parking occurs during time periods 5 and 6, the month of March. Consistent responses throughout the season show a majority of skiers at Aspen Mountain, 65.9 percent, see a need for more parking facilities, whereas 34.9 percent at Snowmass and only 17.4 percent at Buttermilk want more parking (Appendix F, Table V). The critical parking problem at Aspen Mountain relates to the fact that the town is situated at the bottom of the mountain, thus leaving little space for present and perhaps future parking.

Along these same lines, skiers want little change in the free bus transportation and local roads around the ski areas. In the case of bus transportation, it is interesting to note that 20.2 percent are unaware of the bus system. This figure reflects the number of skiers who are not using the free system because of inconvenience or lack of information. The greatest call for a change is found at Aspen Mountain and Snowmass, 24.7 and 22.9 percent of the skiers interviewed, respectively, whereas only 11.0 percent of the skiers at Buttermilk call for a change. Moreover, the specific type of change most frequently requested is more buses, especially at Snowmass (Table V). This is a direct result of fewer buses traveling to Snowmass because of longer distances.

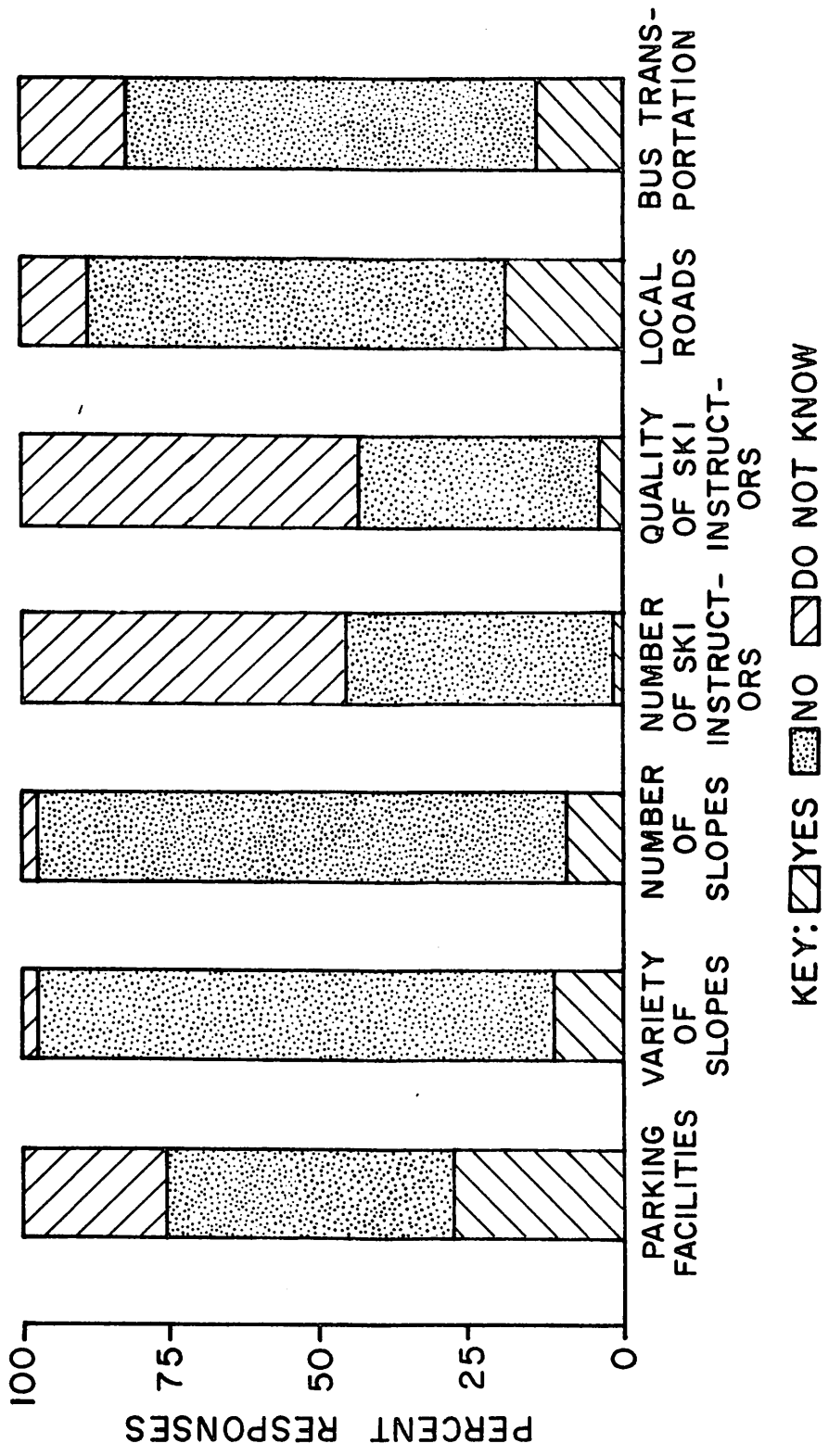

Figure 8A. Skier's Request for a Change in Maintenance or Facilities.

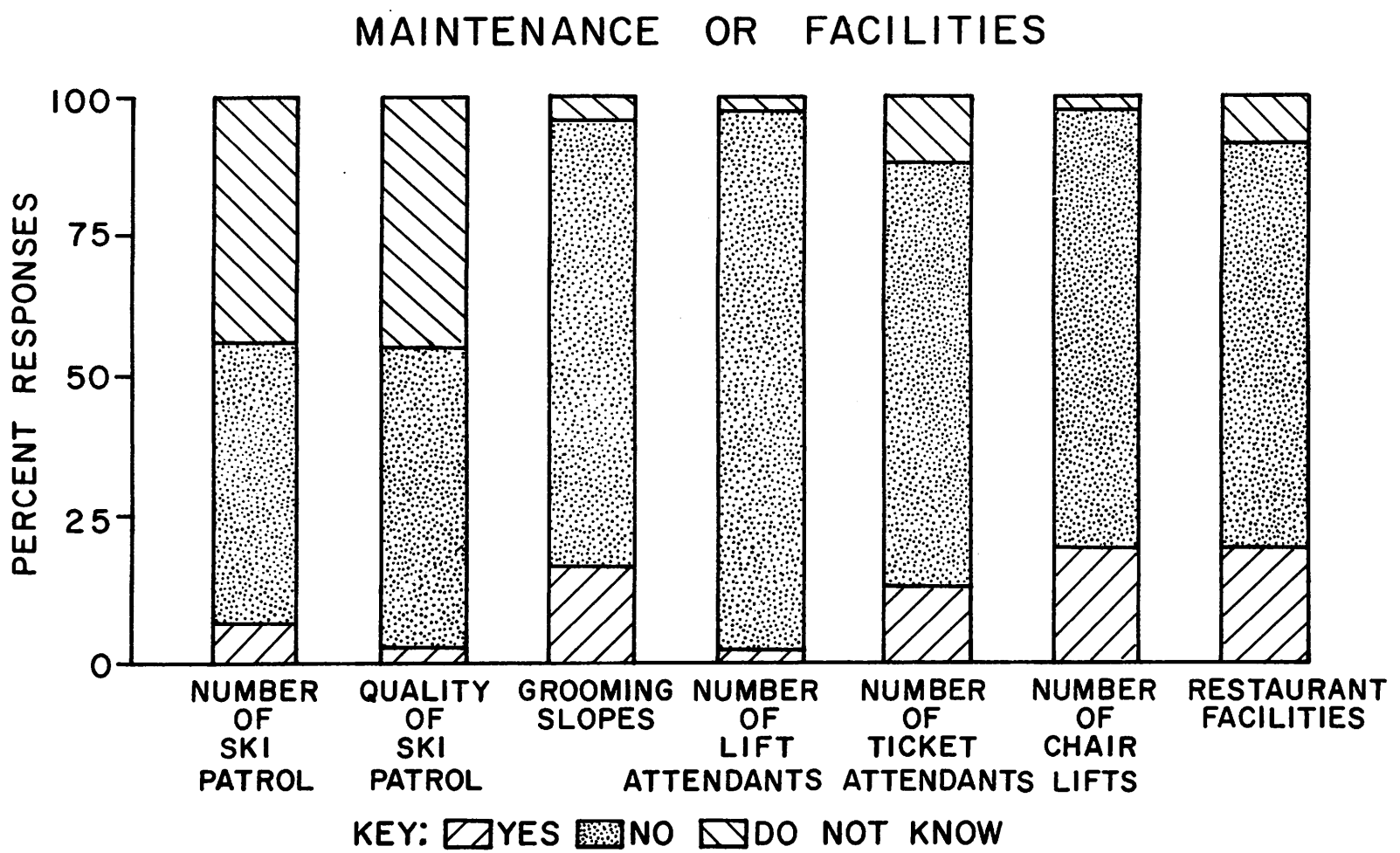

Figure 8B. Skier's Request for a Change in Maintenance or Facilities.

TABLE V

TYPES OF CHANGES REQUESTED IN BUS TRANSPORTATION
(PERCENT RESPONSES)

Types of Changes	Aspen Mountain	Buttermilk	Snowmass
More buses	88.9	33.3	75.0
More bus schedule information	-	22.2	6.3
More bus stops	11.1	44.0	12.5
More buses and schedule information	-	-	6.3

In the case of changes in local roads, more skiers at Aspen Mountain, 31.8 percent see a need for improvement than those at Buttermilk and Snowmass, 21.8 and 22.6 percent, respectively. A majority of the types of change requested are related to maintenance, rather than widening the existing roads or building new ones (Table VI). Generally, it seems that little crowding exists and skiers are well satisfied with both bus transportation and road conditions.

Finally, with regard to the ski slopes, there is not a large request for a change in the variety or number of slopes. In both cases the responses are consistent throughout the season and differ little in regard to location. More variety is requested at Buttermilk and Snowmass, 13.1 and 12.2 percent, respectively, than at Aspen Mountain,

TABLE VI

TYPES OF CHANGES REQUESTED FOR LOCAL ROADS
(PERCENT RESPONSES)

Type of Change	Aspen Mountain	Buttermilk	Snowmass
Maintenance	46.4	33.3	61.1
Widen	17.9	8.3	16.7
General Improvement	35.7	41.7	11.1
Maintenance and Improvement	-	16.7	11.1

7.5 percent. Skiers at Buttermilk and Snowmass indicate they want more difficult terrain. On the other hand, 11.9 percent of the skiers interviewed at Aspen Mountain want more slopes, as compared with 6.4 and 8.7 percent at Buttermilk and Snowmass, respectively. These data

agree with previous results and indicate that skiers believe use is greater at Aspen Mountain than Buttermilk and Snowmass. Moreover, it seems that slope area is no problem presently on any of the mountains.

Apart from specific requests for changes in facilities and maintenance is the evaluation of natural conditions and facilities in relation to the skier's evaluation of use on the ski slopes (Appendix F, Table VI). As hypothesized, as satisfaction concerning the number of slopes and lifts, slope terrain, and general maintenance increases, the evaluation of use on the ski slopes decreases. However, these values are not statistically significant. In addition, the evaluation of snow conditions increases, as the evaluation of use increases. This is probably a direct result of more people skiing when snow conditions are good to excellent, and the fact that snow conditions deteriorate at a faster rate when more people are skiing. The general lack of significance of the r values is probably a result of little or no existing crowded conditions on the slopes.

In general, these data suggest that there is no significant crowding problem among ski facilities on the three mountains nor adverse maintenance of the slopes. The greatest area of need for change is related to chair lifts, mountain restaurants, and parking facilities. An urgent need exists for improvement in parking accommodations serving Aspen Mountain. This can only be solved by cooperative efforts of both the town and ski corporation. Moreover, the lack of crowded facilities supports the belief that quality deterioration has not taken place in regard to facilities and in turn has not created crowded slopes.

Summary

This analysis reveals that the skier's evaluation of use does vary according to location, time of season, week, and day, and under some adverse weather and snow conditions. In Aspen, skiers feel more congestion on the more difficult slopes, characteristic of Aspen Mountain. Thus, carrying capacity will be exceeded at a lower density on more difficult terrain. Variations in the evaluation of use with regard to time demonstrate that beliefs concerning use are a function of actual use. That is, skiers feel there is greater use during February and March, on all days except Saturday, and during the last two hours of the day. Lower evaluations of use are also encountered under adverse weather and snow conditions. These results can be used to predict time and location of crowding as judged by the user. This would seem particularly critical in the future, if actual use continues to grow without ski area expansion.

The skier's judgment of use does not vary greatly according to user characteristics and user's evaluation of maintenance, facilities, and natural conditions. In separate statistical testing only the variables of age, anticipation of crowding, technical skiing ability, participation in other winter sports, parent familiarity with skiing, snow conditions, and number of chair lifts show any significant

variation in the skier's evaluation of use. Moreover, these conclusions do not change when all user characteristics and evaluation of maintenance are tested collectively in multiple correlation (Appendix F, Table VII). The r value of .43 shows that these variables explain, in part, the variation in evaluation of use. However, it is impossible to predict variation from these variables with an r^2 value of .18.

These analyses point to the fact that space is not limited to the degree that the skier's evaluation of use varies significantly under different types of use characteristics, maintenance, and natural conditions. In addition, requests for changes in maintenance do not indicate crowded facilities which are believed to exist before slopes become crowded. This allows the conclusion that space is presently adequate and quality deterioration has not yet significantly taken place in Aspen.

Chapter III References

1. Robert Lucas, "Wilderness Perception and Use: The Example of the Boundary Waters Canoe Area," in Readings in Resource Management and Conservation, ed. by Ian Burton and Robert W. Kates (Chicago: University of Chicago Press, 1966), p. 374.

2. Season pass holders are not included in actual use statistics. Passes may not be used at Aspen Mountain during Christmas and mid-February.

3. The few interviews collected here during time period 4 prevent any statistical interpretation.

4. Daniel Stokols et al., "Physical, Social, and Personal Determinants of the Perception of Crowding," Environment and Behavior, V (March, 1973), p. 89.

5. Charles Cicchetti, "A Multivariate Statistical Analysis of Wilderness in the United States," in Natural Environments--Studies in Theoretical and Applied Analysis, ed. by John V. Krutilla (Baltimore: For Resources for the Future by the Johns Hopkins Press, 1972), pp. 151-158.

6. Ibid., p. 154; George Stankey, "A Strategy for the Definition and Management of Wilderness Quality," in Natural Environments--Studies in Theoretical and Applied Analysis, ed. by John V. Krutilla (Baltimore: For Resources for the Future by the Johns Hopkins Press, 1972), p. 97.

7. Winter sports include the following: ice skating or hockey, cross-country skiing, snowmobiling, tobagganing, sledding, snow shoeing, winter camping, ice fishing and boating, and hunting.

8. B. L. Driver and S. Ross Tocher, "Toward a Behavioral Interpretation of Recreational Engagements, with Implications for Planning," in Land and Leisure--Concepts in Outdoor Recreation, ed. by David Fischer, John Lewis, and George Priddle (Chicago: Maaroufa Press, 1974), pp. 91-112.

CHAPTER IV

HOW DO SKIERS REACT ON CROWDED SKI SLOPES?

Assuming that level of use is an effective element in a skier's experience, the individual may react in several ways when he judges the ski slopes as being crowded. It is hypothesized that the individual is motivated to and subsequently will avoid these crowded conditions. The skier may choose any of the following four ways in which to avoid crowds (Figure 9): by changing his behavior, by adding new supportive information on skier density, by changing the characteristics of the environment, or by reducing the importance of crowding in his skiing experience.

Option 1: Change Behavior

It is hypothesized that one of the simplest ways to avoid crowded situations is to change one's behavior. Moreover, a slight change in behavior by skiing alternative slopes may be effected without damaging total skiing experience.

This specific behavioral alternative was observed through an experiment in which particular slopes were intentionally crowded and the behavior of other skiers observed. The experimental group consisting of eleven volunteer skiers was instructed to ski one of the three slopes at a given time. Each slope was accessible from one slope and ended at the same point (Figure 10). Thus, all of the volunteer skiers arrived at the bottom of lift 3 enabling them to ride the lift together and arrive at the top of the experimental side at approximately the same time. A set of instructions distributed at the beginning of the day enabled each volunteer skier to go directly to the top of one of the three slopes and ski it. The group was distributed in such a way as to obtain a range from zero to eleven skiers per slope, so that behavior was observed in all types of density situations. Even though all of the experimental group started skiing at the same time, each was soon spaced ten to fifty meters apart because of a great variation of technical skiing ability within the group.

The characteristics of the location eliminated the possibility of the skier choosing a specific slope to end at one given location. The terrain did differ slightly among the three slopes with "Fast Draw" characteristic of difficult terrain and "Ute Chute" and "Coney Glade" characteristic of intermediate terrain. Therefore, there was a possibility that the skier might specifically ski or avoid skiing "Fast

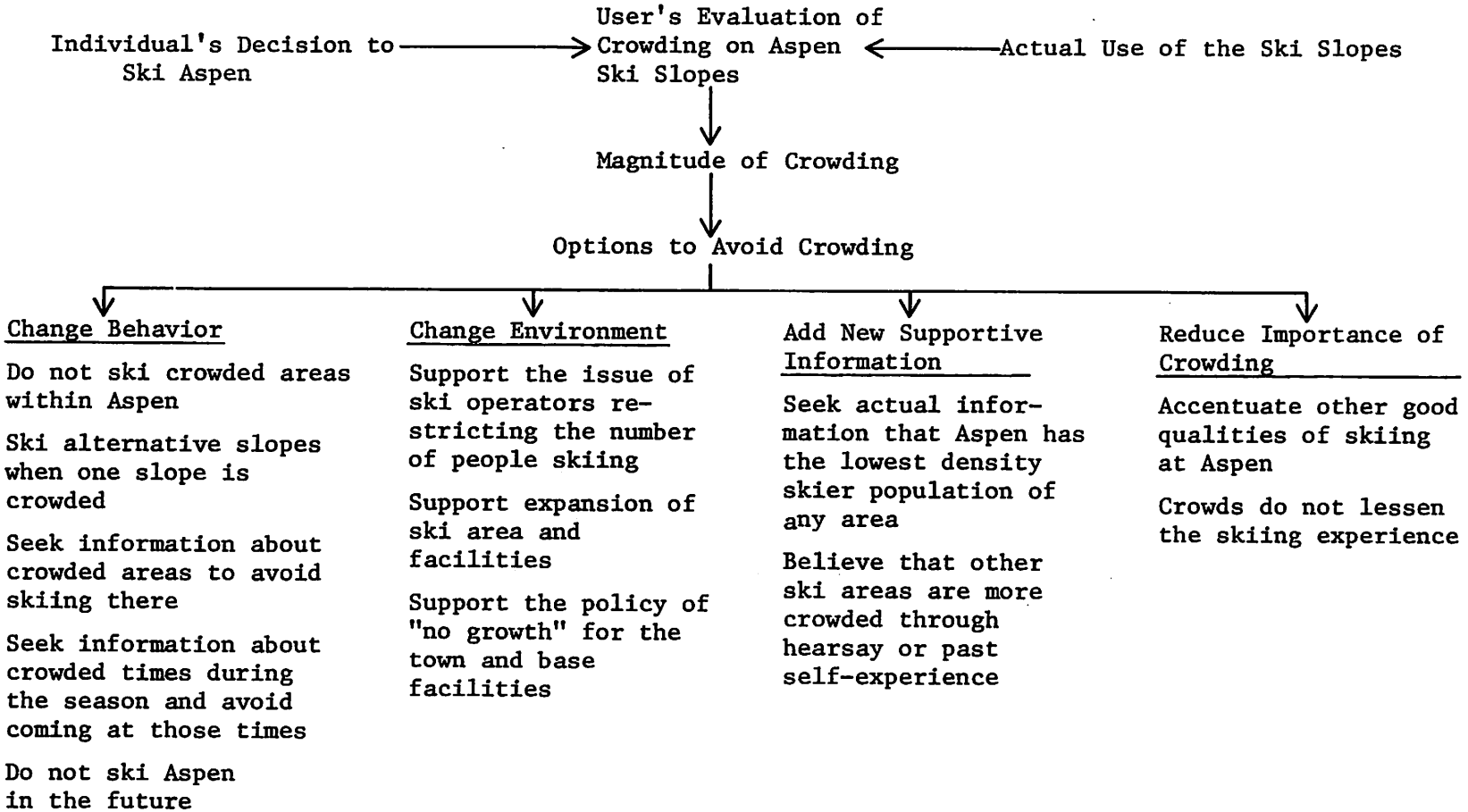

Figure 9. Options to avoid crowding on ski slopes.

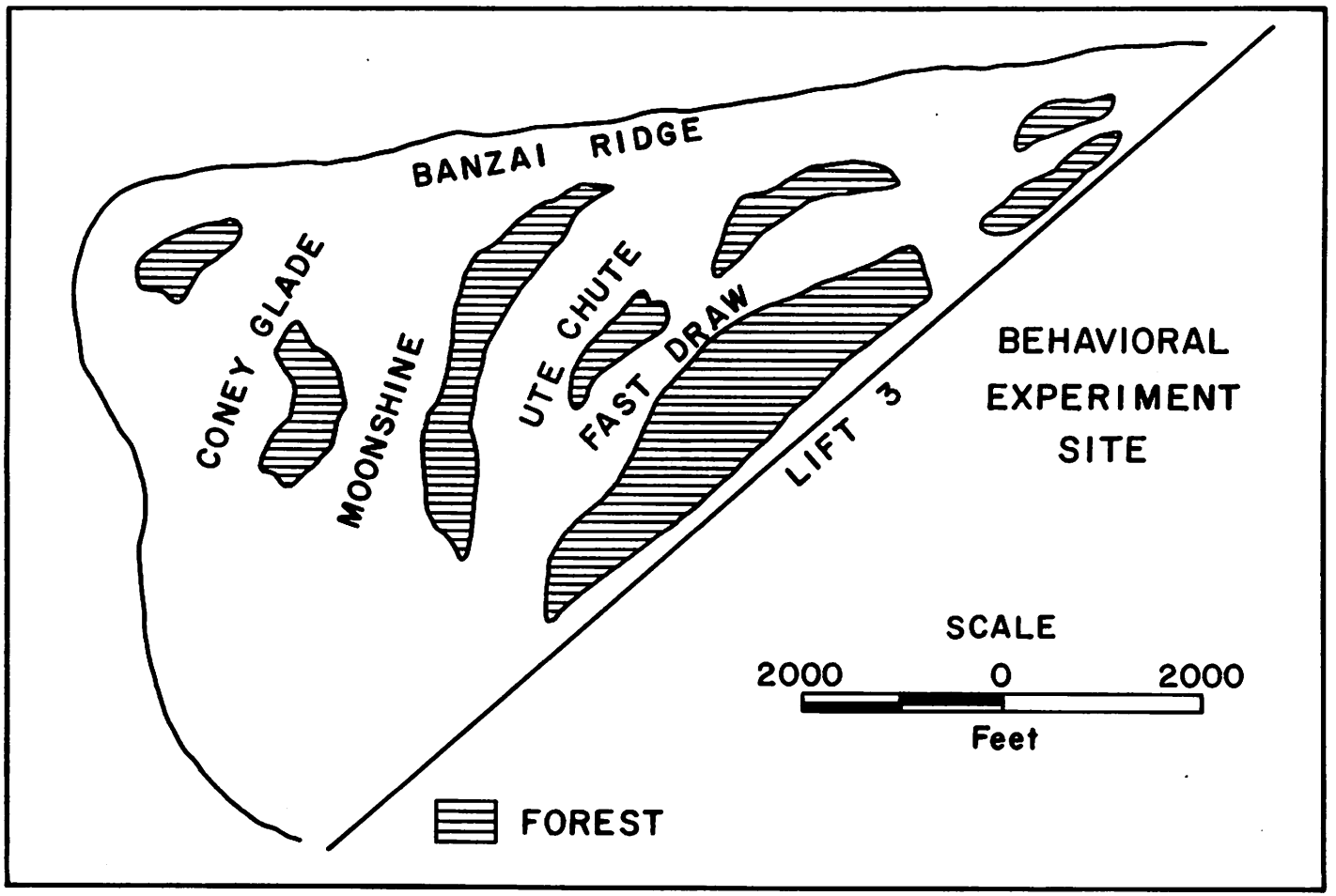

Figure 10. Behavioral Experiment Site.

Draw" because of terrain difficulty. However, this possibility was considered by making most of the observations on "Ute Chute."[1] The experiment was conducted on Sunday, March 17, when skier density at Snowmass was relatively high. The weather was warm and sunny with very good snow conditions, granular snow that was icy in the morning but softened through the day.[2]

It is evident that the skier is concerned with slope conditions, since 95 percent of the observed skiers approaching the slopes stopped on top of the slope before skiing it. These slope conditions encompass the type of terrain, snow conditions, and skier density. Moreover, the skiers' behavior is similar among all three slopes, when comparing their behavior on "Ute Chute" to all three slopes combined (Tables VII and VIII).

The experiment demonstrated that a majority of the skiers do ski the slope when zero to five people are on the slope, a relatively uncrowded situation. It is thought that the individuals who skied another slope under these densities, ranging from 0 to 25 percent of those observed, based their decision on snow conditions or terrain difficulty. Furthermore, the majority of skiers skied alternate slopes or waited until the experimental group was at the bottom of the slope when the number of skiers ranged from six to eleven, a density of 3.04 to 0.66 acres per person.[3] People also altered their behavior to avoid other skiers by following one skier in the experimental group at a comfortable distance. This behavioral technique usually occurred at either extreme side of the slope.

In general, the results from the experiment point to the fact that skiers are motivated to ski alternate slopes or slightly change their behavior on slopes when they believe it is crowded. Furthermore, it seems evident that one will avoid skiing an entire area, if it is crowded. This was substantiated by a question in the interview which asked skiers why they were skiing Elk Camp or Alpine Springs, relatively uncrowded areas at Snowmass. Approximately half of the skier population, 47.5 percent, specifically stated they were skiing here to avoid crowds on other areas of the mountain. In addition, 4.1 percent of the respondents voluntarily stated that they avoided skiing at certain times and areas because of crowds.

Skiers were also asked if they would like information regarding crowds at certain areas or slopes before they actually skied. By means of this antecedent information the skier would be capable of avoiding particularly crowded areas and slopes. A majority of the respondents were interested in an information system regarding crowded areas, 64.2 percent, and slopes, 55.0 percent. These percentages do reflect the importance of crowding on the skier's total experience. At present such information is only obtained through hearsay or experience. Moreover, a system of dispersing such information seems called for; however, it would be difficult to develop an effective system to reduce crowds in certain areas and send more people to low density areas. It is

TABLE VII

OBSERVED BEHAVIOR OF THOSE SKIERS ON UTE CHUTE*

A	B	C	D	E	F	
Number of Skiers in Experimental Group	Acreage/ Person in Experimental Group	% of Observed Who Skied Ute Chute	% of Observed Who Skied Another Slope	% of Observed Who Waited Until Experimental Group at Bottom of Slope	% of Observed Who Followed Experimental Group	Total of Columns D, E and F
None	-	80.0	20.0	-	-	20.0
1	18.25	71.4	-	-	28.6	28.6
2	9.13	75.0	25.0	-	-	25.0
3	6.08	24.1	20.7	17.2	37.9	76.9
4	4.56	60.0	-	13.3	26.7	40.0
5	3.65	-	22.2	77.8	-	100.0
6	3.04	-	33.3	44.5	22.2	100.0
7	2.61	-	40.0	60.0	-	100.0
10	1.83	-	6.3	96.7	-	100.0
11	1.66	20.0	60.0	20.0	-	80.0

*Total number of skiers observed is 247.

TABLE VIII

OBSERVED BEHAVIOR OF THOSE SKIERS ON ANY ONE OF THE THREE EXPERIMENTAL SLOPES*

A	B	C	D	E	
Number of Skiers in Experimental Groups	% of Observed Who Skied the Slope	% of Observed Who Skied Another Slope	% of Observed Who Waited Until Experimental Group at Bottom of Slope	% of Observed Who Followed Experimental Group	Total of Columns C, D, and E
None	77.1	22.9	-	-	22.9
1	77.8	-	-	22.0	22.2
2	75.0	25.0	-	-	25.0
3	24.1	20.7	17.2	37.9	75.9
4	60.0	-	13.3	26.7	40.0
5	-	13.3	86.6	-	100.0
6	-	33.3	44.5	22.2	100.0
7	-	44.4	55.6	-	100.0
10	-	6.3	96.7	-	100.0
11	20.0	60.0	20.0	-	80.0

*Total number of skiers observed is 281.

suggested that information dissemination at the bottom of lifts regarding skier densities in areas is one method. This would require someone actually observing densities on the slopes and communicating this information to lift operators. In regard to slopes, it is recommended that some method be installed only where it is evident that particular problems arise from crowding. In this case signs of warning might be posted on the slope. In both cases, it is suggested that methods of information dispersal first must be tried on an experimental basis. Actual dispersal of skiers then should be observed and tested statistically to conclude whether and how the methods are effective.

The alternative of people not skiing Aspen in the future is felt to be the most resistive change to avoid crowds. As expected, only 2 of the 696 respondents stated that they would not return to Aspen because of skiing crowds. This low number again reflects the noncritical state of crowded ski slopes presently.

However, it seems clear that people do alter their behavior in some way to avoid crowded ski slopes. In addition, it is evident that Aspen presently offers mostly uncrowded areas for skiing, a simple alternative for those disturbed by crowded slopes. The question then arises as to what patterns of behavior will occur in the future if all alternative routes become crowded.

Option 2: Change Environment

Avoidance of crowded ski slopes by changing the environmental element in this study is perhaps the most difficult for the visiting skiers. This results from the fact that environmental changes are made through the community and/or the ski operators. When one is only visiting the area for a short time, it particularly difficult to acquire knowledge necessary for requesting effective restraints on skier population and base facilities or for expansion of the ski area.

Despite this, 5 percent of the respondents offered the unsolicited opinion that the ski area needed expansion of facilities or slopes. A majority of these requests were made at Snowmass. Furthermore, no nonresident of Aspen mentioned the possibility of restricting the number of skiers on the mountain or growth of the town or base facilities. Therefore, it seems evident that the average skier does not think in terms of restriction of growth but rather expansion to accommodate more people to resolve any crowding problems. This means of solution is very short-term, and does not take into account the effects of growth on the community and residents of Aspen.

Option 3: Addition of New Supportive Information

The individual actually seeks supportive information that Aspen offers low density skiing to change his belief that there are crowded

conditions. It is hypothesized that a large part of the supportive information is acquired before the individual actually skis in Aspen. That is, through hearsay and recommendations the individual acquires information that Aspen offers the highest quality in skiing, a part of which is a lack of crowds. This partially confirmed by 12.2 percent of the skier population stating that they specifically skied Aspen because of recommendations from friends. However, consideration is given to the fact that this percentage factor is general, and more specific information in regard to crowding as a quality aspect is required to substantiate authenticity.

It is also believed that the skier may acquire more supportive information while skiing at Aspen. Through actual past experience or hearsay from skiers in Aspen, he is able to compare Aspen to other areas and conclude that Aspen offers the lowest density skier populations. Both of these types of information acquisition require further research for any valid conclusions to the hypothesis.

Option 4: Reduce Importance of Crowding

In this case study, it is hypothesized that the individual reduces the importance of crowding by accentuating the other good qualities of skiing at Aspen or by convincing himself that the crowds did not lessen the skiing experience in time or quality. These two reduction methods are only hypotheses and no information at this time was acquired to confirm or negate them.

Weather and Snow Conditions As Intervening Variables

The effects apparent from crowding also seem similar to other intervening conditions, such as weather and snow conditions. Presently, Aspen offers snow condition reports both locally and nationally. However, 34 percent of the respondents requested a change in snow condition information dispersal. A majority of these skiers wanted a greater quantity of information and more accurate information on snow conditions while in Aspen, while a very low percentage wanted to know more about snow conditions before they came to Aspen (Table IX). This reflects one of the following two possibilities: snow condition reports on a national basis are adequate; or the importance of snow condition information in the decision-making process to ski is much greater at the resort than prior to making the trip to Aspen. In the latter case it seems that snow conditions would largely predict whether a person skied or not or what areas he would ski, if he did.

No information was gathered concerning the effect of weather information on the decision to ski. However, it was found that actual use during certain adverse weather conditions is low (Chapters II and III). This does indicate that dissonance arises because of bad weather conditions, and the skier resolves this dissonance by not skiing. Research has shown that weather reports had a significant effect on

TABLE IX

INFORMATION REQUEST ON SNOW CONDITIONS
(PERCENT RESPONSES)

	Aspen Mountain	Buttermilk	Snowmass
More information at home residence	2.6	18.2	6.8
More information in Aspen	55.3	59.1	68.2
More accurate information	34.2	22.7	20.5
Greater quantity and more accurate information in Aspen	7.9	0	4.5

individuals making a trip to the beach. When suboptimal weather information was obtained, after the individual had committed himself, he was faced with changing the meaning or importance of the information or cancelling the trip to the beach. As expected, those individuals with strong commitments found it more difficult to cancel and usually proceeded, despite weather information.[4] It is hypothesized that similar results would appear in predicting the types and number of people that would ski when hearing suboptimal weather reports. Moreover, a greater portion of the population probably would feel committed to the decision to ski, since they are situated in a resort and presumably came with the primary intention of skiing.

Summary

Observations from the experiment revealed that behavioral changes are definitely evident in crowded situations. In addition, responses to the questionnaire indicate that some individuals change their attitudes to believe there are uncrowded ski slope conditions in Aspen. However, it is impossible to conclude from the information whether there is any cause and effect process between behavior and attitudes. That is, the question of whether behavior causes attitudes remains unanswered, although it is a strong possibility. There is also a need for more specific research on the types and dynamics of attitude change that an individual undergoes when he evaluates the situation as being crowded.

The intervening condition of crowding showed little effect on satisfaction levels of the total skiing experience. Specifically, 88% of the respondents scaled their satisfaction within positive ranks. This demonstrates that satisfaction remains high, despite behavioral

or attitude changes because of crowding. Therefore, it seems that these changes have not affected other quality aspects of the skiing experience. Moreover, it is hypothesized that these satisfactions are highly resistant to change because of the commitment involved in making the trip to Aspen and the length of stay which averaged one week or more for the majority of skiers. Satisfaction levels are also affected by the large amount of excellent reports on skiing in Aspen through recommendations and hearsay. An individual may have a predisposition for high satisfaction before skiing in Aspen simply to conform to the majority of opinions.

Chapter IV References

1. The specific number of observations were eighty at "Ute Chute," thirteen at "Fast Draw," and two at Coney Glade." The number of observations was dependent on the number of people that normally skied the slope and type of terrain.

2. There was only one observer for the experiment. Therefore, only one slope could be watched at a given time. It was impossible to obtain an accurate account of the alternate slopes skied, if the individual did not ski the observed slope.

3. In one instance, when the slope had six people on it, a skier verbally stated the slope was too crowded; she and her three friends skied an alternate slope.

4. Robert L. A. Adams, "Uncertainty in Nature, Cognitive Dissonance, and the Perceptual Distortion of Environmental Information: Weather Forecasts and New England Beach Trip Decisions" (unpublished Ph.D. dissertation, Clark University, 1971).

CHAPTER V

SUMMARY AND RECOMMENDATIONS

In general, findings in this study indicate that social carrying capacity levels of the ski slopes are at prevailing levels of preference. Skiers feel that use at each ski area is approximately dispersed on a scale from vacant through sparse, dispersed, crowded, to congested. This appears to be an acceptable optimum level. There is one exception: crowding is felt during time period 4 at Aspen Mountain. The high degree of terrain difficulty and actual use increments on the mountain are believed to account for skiers sensing these crowded conditions. Skiers believe use is significantly lower on Saturdays, a travel day for most tourists. Skiers also rate densities significantly lower in the early morning hours than in the last two hours of the skiing day, and under some adverse weather conditions and snow conditions occurring particularly at the beginning and end of the season.

In the skier's judgment facilities seem adequate with some exceptions. In particular, there is a well documented demand for more chair lifts at Aspen Mountain and Snowmass during time periods 4 and 5, for restaurant facilities at Aspen Mountain, and for improved parking for skiers at Snowmass and Aspen Mountain. However, the possible effect of facility expansion, particularly parking and chair lifts, on increasing use must be considered before action is taken. In addition, a majority of users expressed interest in some type of system for giving skier density information at specific areas and slopes and more accurate snow reports at more accessible places in Aspen.

This study does not find significant correlations between skiers' evaluations of use and many of the different user characteristics. In all probability this is a direct result of densities not being great enough to create stressful situations so as to demonstrate differences. Moreover, the lack of significant results reflects the heterogeneity of the skier population which in turn creates a wide range of views toward use. However, groups which do show significant differences in sensitivity to crowding are those who are under the age of thirty, have a high technical skiing ability, participate in other winter sports, and had parents that skied.

These results can be partially compared and contrasted to research findings in wilderness studies. For example, in a spatial context there

is a parallel in the greater sensitivity to crowding between expert skiers on difficult terrain and canoeists, rather than between skiers and boaters or motor-boaters, in the core of the wilderness area.[1] Comparison is difficult between the two case studies since methods and scales differ in measuring attitude towards use. Those upset by congestion in wilderness areas are the users who are older when they first visit a wilderness area, have had auto camping and hiking experience during youth, have a discriminating view of the wilderness, or had a nonrural childhood residence. These characteristics differ somewhat from the findings in this study, especially the variables of age and residency. However, large discrepancies are not evident when considering the total number of characteristics tested. On a more encompassing scale the "purist" wilderness users are associated with higher education levels, age, income (until income reaches $17,900), male rather than female, nonrural residence, childhood hiking experience, and membership in a conservation group. These "purist" wilderness users are characterized not only by their desire for low intensity use but also undisturbed ecosystems and challenge from the recreational activity.[2] Therefore, discrepancies in the definition of the dependent variables between the two case studies make a comparison of their findings inappropriate.

Finally, present space is adequate based on the low sense of crowding and high satisfaction levels. This is further substantiated in an experiment which demonstrated that Aspen presently offers alternative, uncrowded slopes for the majority of skiers who change their behavior when they find crowding. However, the analysis of present user characteristics and actual use trends confirm the prospects for future growth. Therefore, the present concern seems to relate to how Aspen can preserve this quality in the future.

Constraints

It is necessary to analyze any variables within the institutional framework affecting implementation of policy and guidelines before realistic recommendations can be proposed. In this study, the policy issue concerns growth or restriction of use at the ski area as alternative approaches to the maintenance of low densities. This issue is complicated by the fact that a majority of the ski area is located on public lands and is operated by a private corporation. The three groups who influence and determine the type of policy are the Aspen Skiing Corporation, the U.S. Forest Service, and the citizens of Aspen. Three major problems which arise from view on policies of the three groups are: the equity of different modes of restricting public use, the conflict over the issue of growth between the citizens of Aspen and the Aspen Skiing Corporation, and the temporal changes in skiing patterns which may evolve from changes in ski slope or housing management policies.

Public Attitudes and Policies in the Local Community

The increase in skiing activity in Aspen is the primary source of economic change and a predictor of employment levels, retail sales, and total personal income. While it may seem that Aspen is profiting from the economic boom caused by the ski industry, the community is also realizing that it is becoming solely dependent on recreation and is now facing the long-term problems of environmental pollution, traffic congestion, shortages of low and moderate income housing, land speculation, inadequate services such as hospital and airport facilities, and specializing itself as a young, wealthy community. In addition, a fear exists that the ski slopes are becoming overcrowded, since the number of beds for tourists already exceeds the physical capacity of the ski area, particularly at Aspen Mountain.[3]

An immediate solution to these problems sought by a majority of the community is a mandate to control growth. This is reflected by the election in 1972 of two county commissioners who based their platforms on controlling growth and the passage of Building Permit Review Ordinance 19 in 1973. This ordinance emphasized preservation of the natural environment in new development areas, growth by density regulation, and down-zoned areas for no new development.[4]

Therefore, a majority of the community seems to favor little or no expansion of the ski area at the present time. This position reflects the community's fear that an expanded ski area will attract a larger skier population and will consequently cause an expansion of base facilities and further deterioration of the environment. In addition, it is noted that there is an equally active minority continuing to favor growth. The proportions of those favoring growth and of those favoring growth control may be subject to change in the future.

U.S. Forest Service

Throughout its history the U.S. Forest Service has endorsed the land management goal of providing the greatest good for the greatest number. However, the goal has never been defined clearly enough to be useful in the decision-making process. Therefore, even though the Forest Service, as the lessor, legally has the right to oversee the type and rate of development on the ski area in Aspen, it can not firmly establish that the land is not being managed so as to best meet the needs of the people.

The Forest Service has exercised the responsibility of managing the ski area by requiring a master plan for development from the ski operator before approval is granted to lease the land. However, only in the last couple of years has the Forest Service been required to submit an environmental analysis report before any development takes place. This has been the first serious inhibition of development. Their resource management policies have also been broadened to take into account local politics and feelings toward growth. In regard to this policy, their requirements in 1973 for new ski development are the following:[5]

1) Public use, forms of use, and facilities shall be regulated so as to not over develop or over use the area and cause a decline in the quality of the recreation experience;
2) Expansion of existing public use facilities and construction of facilities shall be coordinated with the urban needs and capabilities of the local community as well as with the regional and national needs;
3) Open space, esthetics, forest atmosphere, and quality of the recreation experience shall be considered first in developing plans for expansion or construction of facilities;
4) All planning shall utilize principles of landscape architecture, and qualified staff personnel shall actively participate in the planning process.
5) Maintenance of the forested appearance of Aspen's and the surrounding area's mountain backdrop shall be considered in all development and use plans;
6) Full development of the area's recreational potential, consistent with the limitation listed herein, is the prime management objective;
7) The special zone shall be divided into management units to provide for localized and concise management direction. Functional plans shall be developed for each management unit as necessary.

Even though these management objectives do include both social and physical aspects of the impacts in development, there are no explicit guidelines or methodologies to carry out the stated objectives. This is further supported by their environmental analysis reports having little or no research or comment in regard to social impact.

This statement of objectives did facilitate more research by the Forest Service on ways in which to develop carrying capacity guidelines. In lieu of the standard method of evaluating capacity by physical lift capacity and vertical drop of the slope, the P.O.D. concept (planned optimum density) was developed. This concept selected one base year as optimum for skier density and averaged the density of skiers for each area served by a particular lift. The critical drawback of this method is the subjective, nonscientific way in which the optimum year was selected.[6]

In addition, the district ranger has considerable discretion on enforcing policy regulations on development. Since the district ranger changes approximately every four years, the consistency of policy fluctuates drastically. For example, the Forest Service attempted to implement the P.O.D. concept for regulation of skier population growth in 1973. However, both its findings and concept were dropped upon the transfer of the district ranger in 1974.

It seems evident that the Forest Service has the potential to restrain ski development growth. Even though some attempt to establish means of evaluating optimal use and subsequently restricting use was made

recently, the present policy is one of non-constraint. It can be argued that this is a result of the Forest Service being caught between the goals of full development desired by the ski corporation and protection of the environment by inhibiting development desired by the town. Moreover, the Forest Service has developed a close rapport with the Aspen Skiing Corporation by working with them on any physical land management problems, particularly on sites of new ski facility construction. As a result, the Forest Service personnel believe that the corporation is making every effort to maintain and develop a quality ski area.[7] In contrast, this type of rapport does not exist between the Forest Service and town. Finally, it is apparent that the Forest Service is in need of new management guidelines and a realistic, explicit, long-term statement of goals for the development and use of the forest area for skiing.

Aspen Skiing Corporation

Throughout its ski development the Aspen Skiing Corporation has striven to offer a quality recreational experience to every skier.[8] In providing this quality in the past, the corporation has profited largely from a population willing to pay the high price. In part, quality has been achieved by the corporation employing three full-time planners to assess present conditions and develop new plans, both in physical and social capacities. Their present method of determining carrying capacity is by allocating a certain number of people per acre and projecting the total skier population on these figures. Specifically, they plan for fifteen skiers per acre on novice terrain, ten on intermediate terrain, and five on difficult terrain. These are generous guidelines compared to other U.S. ski areas, even though the method does not account for uneven distributional effects.

In terms of immediate future growth plans the corporation wants to enlarge the Snowmass area by adding new chair lifts and trails to connect presently separate areas. Their long-term plans call for a major new development in the Owl Creek area between Snowmass and Buttermilk ski areas. However, the implementation of both plans has been slowed by the panic of the energy crisis in 1973-74 and by growth restrictions on base facilities by the County Commissioners.

The corporation feels that skier density has exceeded optimal levels only on Aspen Mountain at certain times during the season for the past two years. An attempt to alleviate this problem was made during the 1973-74 season by limiting the number of season passes sold and by restricting season pass holders from skiing Aspen Mountain during peak skier days, December 22 through January 4 and February 16 through February 22.[9] However, it was felt that this solution only transferred the problem of crowding to Buttermilk and Snowmass where season passes were honored. Therefore, in the 1974-75 season the corporation has taken action to restrict season passes from all three mountains from December 21 through January 5 and February 15 through February 28.[10] It is clear that the corporation is definitely concerned about maintaining uncrowded slopes for quality recreation. Furthermore, when the

corporation feels that optimal skier densities are being exceeded, they reduce use by making the season pass holder, the Aspen resident, pay more or by directly restricting the use of his pass.[11]

Restriction of Use

The variables considered in the restriction of use of a recreational activity center around the questions of for whom, how many, and what quality. In this study it has been argued that the management is trying to maintain low density skiing by restricting the time and area that season pass holders can ski or by making the season pass holder pay more for skiing.

The monetary type of restriction is highly controversial in particular to the Aspen resident and in general to the business ethics of providing recreation on public lands. In this specific case, the Aspen residents feel that they should not be the only ones to forfeit skiing privileges because of the crowding problem. Their proposed solution is to restrict tourist skiing on Aspen Mountain, not the local resident.[12] However, this view does not reflect an historical perspective on the management's policy. The corporation has always made the tourist pay more for skiing. Therefore, the tourist could argue that past pricing policies have discriminated against the tourist and have favored the Aspen resident. Skiing has thus been restricted to tourists with higher incomes, since the price of lift tickets here is higher than most nearby areas. The Aspen resident in the past was given a price reduction, since it was felt that the local business community supported the ski industry by providing services. It is evident that this reduced pricing has come to be expected, since residents have reacted strongly to the new policies. Therefore, it seems that the corporation is presently asking the local population to pay more than in the past and eventually maybe the same as the tourist for quality skiing. Moreover, in accordance with their plea for preserving the entire community and imposing growth restrictions, it can be argued that the local residents should be willing to pay a price, not only for the town but also for the skiing.

In all recreational activities on public lands monetary means of restricting use have usually been avoided. This stems from the fact that public lands have been viewed historically as belonging to all the people; therefore, lands should be managed for all, not for any particular class. On the other hand, some researchers have recently advocated some kind of fee method to facilitate more effective conservation management and use.[13] In this study the question then arises as to what are the discrepancies between the traditional views of use on public lands and use on public lands leased and operated by private profit-making corporations. In agreement with the historical perspective, it can be argued that the corporation should review its concept of providing limited recreation opportunities to so few of the population on a finite public resource. Moreover, it seems that monetary restriction is a short-term solution. For example, if present policies continue, the Aspen resident will soon pay the same as the tourist, and both will continue to pay higher prices, eventually restricting use to even higher income groups.

Other methods of restricting use are mail reservation, first come-first served, physical ability, zoning, and time-sharing permits. Both methods of first come-first served and physical ability seem inoperative in this specific situation. In the case of the former, it seems unjust to prohibit skiing to people after they have traveled long distances at great expense to ski in Aspen, while the latter approach would cause serious operational problems. A similar problem exists with zoning areas for a certain number of a given type skier. Therefore, it seems that the time-sharing and mail reservations are the only feasible alternatives for a means of restricting use.

The time-sharing permit system allocates a given number of skiers on the mountain on certain days. This permit system only seems applicable here if it is known that total bed capacity does not exceed the total skiing capacity. On such an assumption, the skier always has the assurance that he is able to ski somewhere in Aspen. This method seems appropriate in the present situation where one mountain is crowded certain times of the year and other areas, particularly Buttermilk, can afford greater use. On a long-term basis it is recommended that the corporation adopt a mail reservation system. This system seems feasible since reservations for skiing could be made with hotel reservations and perhaps at a local center for Aspen residents and those people not requiring hotel accommodation. Even though both of these systems require much research on the amount of non-resident bed capacity, percentage of resident skiers, and percentage of skiers not requiring hotel accommodations, they would not suffer the serious disadvantage of favoring any one user group.

It is recommended also that research pertinent to each of these possible means of restriction be conducted before any restriction is employed. Specifically, it is advantageous to evaluate whether users favor any management strategy to maintain carrying capacity levels and which strategies they favor. Similar types of study are being conducted on carrying capacities of river-running on the Colorado, Green, and Yampa rivers.[14] By means of this evaluation management is then able to maximize user acceptance of the strategies. Evaluation of the restriction method on a regional impact basis is recommended, since the mail reservation system has been tried and has failed in the past.[15] Finally, it is strongly suggested that research be conducted after any restriction is employed to determine its effectiveness and possible improvements.

Recommendations

The following recommendations grow out of the findings reviewed above. In terms of facility expansion for Aspen the findings indicate that management should provide another restaurant or expand the two existing restaurants on Aspen Mountain. At Snowmass parking lots should be expanded and more chair lifts, preferably ones which would connect existing separate areas, should be built.

It is recommended that all lodging facilities not base their week occupancy from Saturday to Saturday, but rather select different days on which weekly occupancy begins and ends. This would facilitate dispersal of use throughout the week and perhaps could also alleviate crowded airport facilities on Saturdays. In addition, the similar case of skiers' believing that use is significantly lower during early morning hours and higher during the last two hours of the skiing day supports the strategy of staggering the opening and closing of lifts. However, such a plan demands provision of much information for skiers and research on the actual effectiveness of the plan. In addition, significantly lower actual use statistics and skiers' evaluations of use at the beginning and end of the season call for some method, such as advertising or further reduced hotel accommodation costs and lift ticket rates, to promote more use at these times. Even though excellent snow conditions are not guaranteed at these times, people may be willing to sacrifice optimal snow conditions for less crowding and lower costs.

A demand for more snow reports, both in terms of quantity and quality, in Aspen is evident. Quality improvement comes from each ski area manager, and quantity improvement suggests the need for more locations for the information, such as posting at restaurants, hotels, and ticket offices. Furthermore, a recommendation is made to disseminate information on density of use at specific areas and slopes. It is felt that such information could enhance the skiing experience through a more equal distribution of skiers. However, this requires further research in terms of the methods to be used for information dispersal and its actual effectiveness on skier distribution.

Finally, recommendations to alleviate the crowded facilities and slopes at Aspen Mountain are more complex, since the area is adjacent to the town of Aspen and there is little area for expansion. Moreover, crowding will probably not be alleviated, since more users here are the type that sense crowding at lower densities. Therefore, an immediate solution is called for and seems oriented towards restriction of us rather than expansion of facilities and areas.

The issue of expansion or restriction of use pertains not only to Aspen Mountain but also to the entire skiing complex. At present the constraint of the no-growth policy as advocated by the community seems strong enough to defeat the corporation's desire for expansion. Thus, restriction of use is recommended to maintain present optimum use at Snowmass and Buttermilk and to lower present densities on Aspen Mountain during time period 4 to achieve optimal use levels throughout the season (Figure 11).[16] Moreover, the present means of restricting season pass holders, Aspen residents, on Aspen Mountain during peak times of skier densities does not seem to be an effective solution, since respondents felt the mountain was crowded during times of restriction. This fact and the inconsistency of monetary restriction with views on use of public lands leads to the recommendation that other means of restriction be adopted. The most equitable and operative

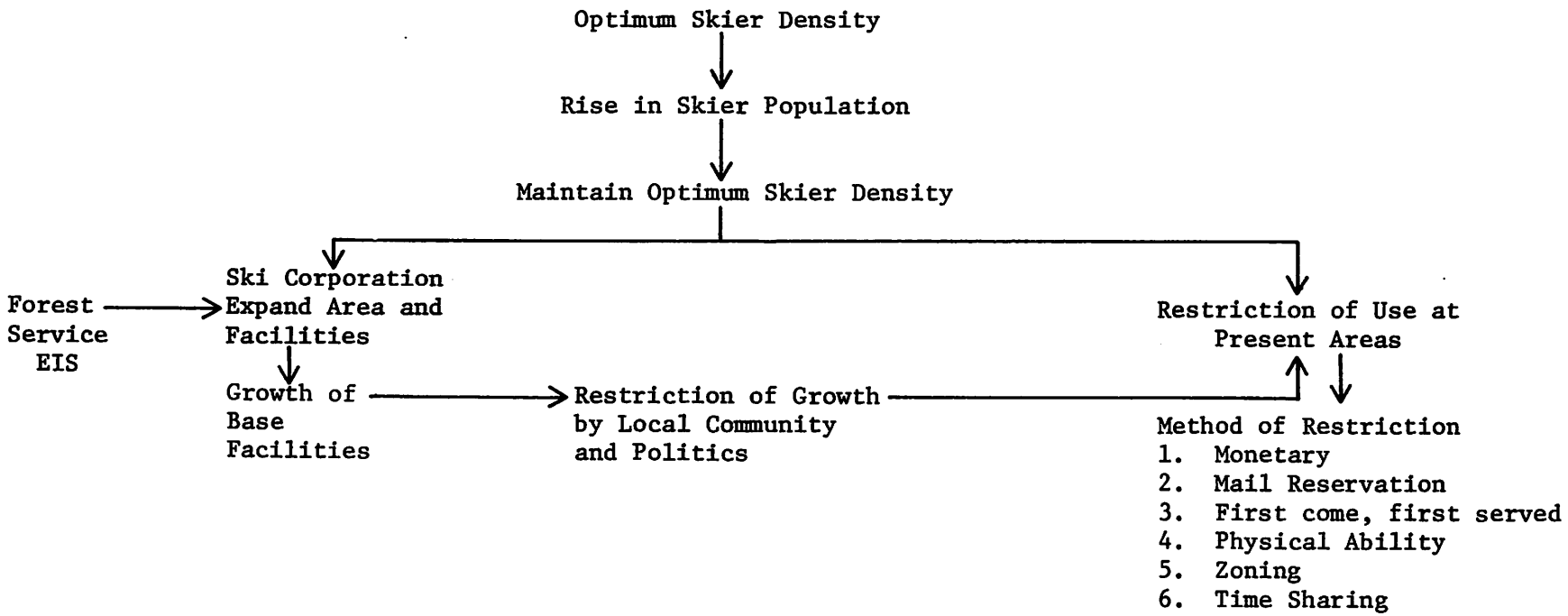

Figure 11. Flow diagram of policy guidelines to maintain optimum skier density.

solutions are the time-sharing permit, a short-term solution to alleviate crowding on one specific mountain, and the mail reservation system.

Research Needs

The research reported here is intended as a contribution to the study of the effect of congestion on the individual's recreational experience, in particular, and on carrying capacity, in general. However, development of a full operational definition of quality should also include an analysis of the physical and biological components of the ecosystem and the dynamics, past and present, of the institutional and legal guidelines in which the system must operate. In particular, the policy variable seems most critical in determining carrying capacity, since it sets the guidelines for density of use; ironically, it is the least understood of all variables. In this study present policies are reviewed and integrated into the research findings. However, more research is needed to determine the effects of any quality or degree of policy change. This is particularly needed in the case of the Forest Service which presently is not controlling development but potentially has effective authority to do so.

The study does not incorporate the secular effect of social carrying capacity. In the long term, those with low tolerance of crowds will leave to seek experiences in other areas or recreational activities, such as an alpine skier becoming a cross-country skier. These individuals leave a group which tolerates higher levels of use. Therefore, this indicates that socially acceptable levels could grow with increased use, until all alternatives are characteristic of high density use. The question that remains for further research is one of determining future levels of acceptable change for a majority of users, and what types of users are desired by management. Thus, the situation involves a predictive dynamic process in which users can be grouped by their characteristics and tolerance of crowding.

The study considers only congestion as the determining factor in defining quality. It is hypothesized that this is the major component; however, further research should attempt to confirm this assumption. For example, "purist" wilderness users are characterized by desiring not only low intensity use but also a challenging experience from the recreational activity and an undisturbed ecosystem. Therefore, research might try to define the "purist" skier and evaluate the importance of space as a goal in the recreational experience. Moreover, not only crowding but also all intervening conditions, such as weather and snow conditions, are worthy of further inquiry. An interview could be constructed to evaluate the importance of all variables in the decision-making phase to make the trip to Aspen and to ski while in Aspen. A comparison of these two different decision-making phases should reveal contrasting results. In addition, it also might be possible to rank the importance of each variable in the decision-making process and then predict total skier use from their effects.

With the exception of studies of carrying capacity within the concept of wilderness experience, from which it differs significantly, this study is one of the first to apply a definition of carrying capacity to recreational research. It is suggested that "carrying capacity" should become a topic of study in all types of recreation. Thus, a common scale of perception can be established for use among all recreational activities, and comparisons of such activities would facilitate the ranking of each activity in terms of carrying capacity. Moreover, continued research of this type within the activity of skiing would facilitate recommendations on a regional basis. Regional findings should promote more effective policies, particularly those restricting use, more areas zoned for different levels of use, and a more equal distribution of skiers to maximize user satisfaction by the guidelines of user density. A continued research effort in this area would make it possible to show if more user characteristic variables become significant in the evaluation of use as densities increase. Moreover, research of this type in more congested areas, such as Winter Park, Colorado, or Stowe, Vermont, might show contrasting results to this study, and the conditioning effect of congestion on the skier's evaluation of use and satisfaction. Additional findings might reveal that facilities actually become crowded before the slopes themselves, a relationship that was not strong in this study.

This study integrates both attitudes and behavioral reactions toward congestion in determining social carrying capacity guidelines. To date, much of the research has not included observations and analysis of actual behavior. Since a wealth of information was obtained from the behavioral experiment, it is suggested that research along those lines be continued and refined. In extending the usefulness of this study it would be helpful to obtain more information on hypothesized attitude changes which should further show the full range of changes undergone by an individual on crowded ski slopes, indicate a cause and effect relationship between attitudes and behavior, and substantiate or negate the attitudes reflected in the interviews.

It is recommended that air photography, remote sensing devices, and movies taken from the air should be used to obtain detailed information on actual skier distribution and density. Such information would also show precisely the amount and shape of space needed by skiers with specific technical abilities and speeds. Methods of dispersing information about skier densities should also be developed as an aid in achieving optimal distribution of skiers.

Finally, this study is viewed as contributing to the field of resource management in decision-making. It focuses on optimization of human needs and satisfaction, user's and manager's perception, attitudes, and behavior, rather than treating economic optimization as the governing criteria. It is hoped that further research can integrate these types of findings into a comprehensive framework, one which includes economic evaluation and policy and agency coordination.

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4. Ivan Goldman, "Aesthetics Becomes Politics in Aspen," The Sunday Denver Post, Mary 26, 1974, pp. 1, 4; "Council Gives Final OK to Ordinance 19," Aspen Times, July 19, 1973, pp. 11-B.

5. John Burns, "Aspen Urban Influence Planning Area" (unpublished U.S. Forest Service paper No. 380.2, Aspen Ranger District, White River National Forest, 1973), p. 3.

6. John Burns, Ski Growth Potential, Draft Report, January 1973 (Aspen, Colorado: Aspen Range District, White River National Forest, 1973).

7. Robert M. Rankin, Forester, Aspen District, White River National Forest, private interview, Aspen, Colorado, July, 1973.

8. Jim Snobble, general manager of Snowmass ski area for the Aspen Skiing Corporation, private interview, Aspen, Colorado, June, 1973.

9. Season passes are purchased during the summer before the ski season for $250 and traditionally have permitted skiing every day on any of the three mountains for that season.

10. Tom Richardson, vice-president of the Aspen Skiing Corporation, private interview, Aspen, Colorado, March 21, 1974.

11. Ibid., February 20, 1975.

12. Editorial, "Top Profit for the Ski Corp. and City," Aspen Times, May 30, 1974, p. 2-A.

13. Paul W. Gates, The History of Public Land Law Development, For the Public Land Law Review Commission (Washington, D.C.: U.S. Government Printing Office, 1968), p. 569; Marion Clawson, The Land System of the United States (Lincoln: University of Nebraska Press, 1968), p. 136; Lynton K. Caldwell, "Politics and Public Land Policy," in America's Public Lands: Politics, Economics, and Administration, ed. by Harriet Nathan, Conference on the Public Land Law Review Commission Report (Berkeley: University of California, Institute of Government Studies,1972), pp. 320-322.

14. John Hunt et al., An Initial Report in River Use and Management Research for Canyonlands National Park (Logan: Canyonlands Natural History Association, 1974), pp. 67-69; Mathanna Al-Hoory, "Social Capacity and Quality Recreation," in Recreational Carrying Capacity in Wilderness - A Series of Topical Papers, ed. by Perry J. Brown and John H. Schomaker (Logan: Utah State University, Institute for the Study of Outdoor Recreation and Tourism, 1973), pp. 44-47.

15. Arapahoe ski area employed a reservation system for the ski season of 1972-73. The reservation system failed: the area actually lost money and never reached its quota for the season. It is felt that the poor organization of the system, particularly the lack of information about the system and operation of it out of Denver and the opening of nearby ski areas contributed to the failure. This information was obtained from Charles Goeldner, private interview at the Business Research Division, University of Colorado, August 21, 1974.

16. It is generally believed that Buttermilk can handle increased use throughout the ski season and still maintain optimal levels of use.

APPENDIX A

INTERVIEW: STANDARDIZED QUESTIONNAIRE

Data Collection by the Interviewer:

1. Specific location of interview: _____

   A) Ski Area: Aspen Mtn. _____, Buttermilk _____, Snowmass _____.
   B) Restaurant _____, Lift Line _____, Parking Lot _____, Bus Stop _____.

2. Date: _____ Time: _____

3. Weather: Temperature _____, Winds _____, Snowing _____, Not Snowing _____, Blowing Snow _____, Cloud Cover _____, Partly Cloudy _____, No Cloud Cover

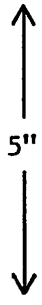
4. Snow Conditions:

	Top	Midway	Bottom
General Conditions			
Ratings			
Base			
Powder			

5. Total number of people skiing the particular mountain for the day _____.
   Total number of people skiing the Aspen area for the day _____.

6. Total number of people at specific location of interview _____.

7. Interviewer's objective view of the number and distribution of people skiing for the day. Mark anywhere on the continuous line on the following card:



-Congested: Skiers' territories overlap and some contact with other skiers.
-Crowded: Skiers' territories are adjacent and sometimes their territories overlap.
-Dispersed: Numerous skiers but each skier's territory never overlaps.
-Sparse: Presence of few skiers and skiers' territories are far apart.
-Vacant: No other skiers in visual contact.

Introduction

I am Coe Crum from the University of Colorado conducting a research study on various aspects of Alpine skiing in the Aspen area. I would appreciate your response to the following questionnaire for aid in the study.

Interview

1. Why did you choose to ski the Aspen area instead of any other ski area? _____

2. How many total number of years have you skied? _____

3. Approximately how many different resort areas in the world have you skied? _____

4. Have you ever skied in New England? _____
   Have you ever skied in the Midwest? _____
   Have you ever skied in the Far West? _____
   In what area of the country have you done the most skiing?

5. Do you participate in any other winter sports other than Alpine skiing? _____. If so, what? _____

6. How many total number of years have you skied in the Aspen area? _____

7. How many total number of days have you skied this season in Aspen? _____

8. What kind of pass do you have? Classification:
   Season _____, Complimentary _____, Daily _____,
   6 day _____, $60 _____, 30 day _____, 3 day _____,
   Colorado U.S.A. _____, Student discount _____.

9. Which specific area(s) do you ski the most:
   Aspen Mountain _____, Highlands _____,
   Buttermilk _____, Snowmass _____.

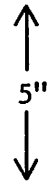
10. How many people are you skiing with, other than yourself? _____

11. How would you rate your technical skiing ability:
    Beginner _____, Advanced Beginner _____, Intermediate _____,
    Advanced Intermediate _____, Advanced _____, Expert _____.

12. If you do not live in Aspen, what mode(s) of transportation did you take to get to Aspen:
    Car _____, Bus _____, Train _____, Plane _____.

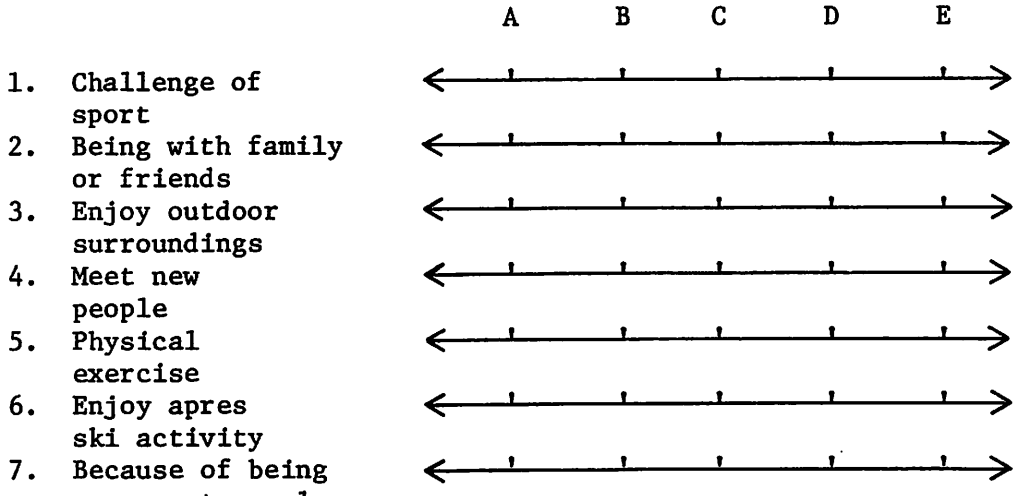
13. Approximately how many miles did you travel to get to Aspen?
    _____.

14. On the following card, how would you evaluate the cost of your stay here in Aspen--you can mark anywhere on the continuous line:



-Almost prohibitive in cost
-Extravagant cost
-Expensive
-Average cost
-Not expensive at all

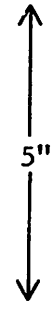
15. On the following card are various reasons to ski. I would like for you to evaluate each one of these reasons in importance to why you ski. You can mark anywhere on each continuous line.



A - Very Important
B - Important
C - Slightly Important
D - Neutral
E - Not Important

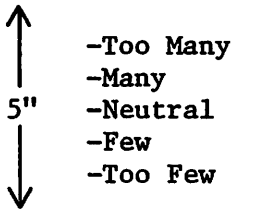
16. Do you avoid skiing certain areas _____ or certain time periods _____ during the ski season because of a known high total number of people skiing?

17. On the following card, how would you evaluate the number and distribution of people skiing for your total skiing experience today. You may mark anywhere on the continuous line.

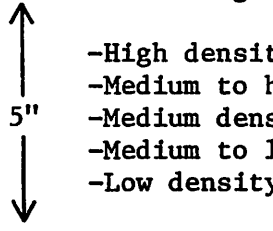


-Congested: Skiers' territories overlap and some contact with other skiers
-Crowded: Skiers' territories are adjacent and sometimes their territories overlap
-Dispersed: Numerous skiers but each skier's territory never overlaps
-Sparse: Presence of few skiers and skiers' territories are far apart
-Vacant: No other skiers in visual contact

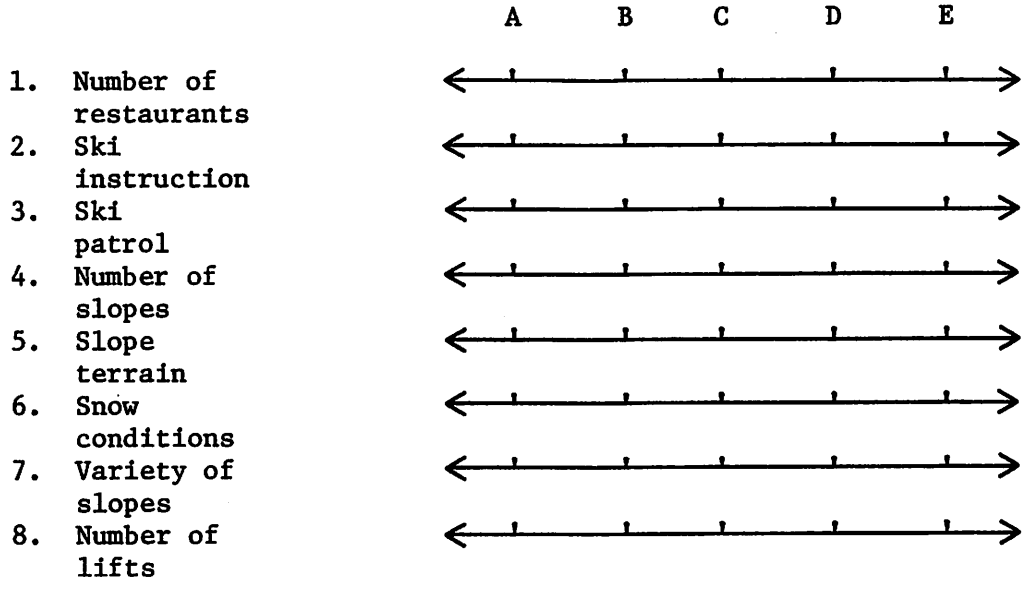
18. On the following card, how would you evaluate your feelings about the number of people skiing today. You may mark anywhere on the continuous line.



19. Before you actually skied today, did you think about how many people would be skiing today _____. If yes, did this influence the particular area you would ski _____. If yes (to first part), on the following card how many people did you think would be skiing? You may mark anywhere on the continuous line.



20. On the following card, would you please evaluate each of the features or natural conditions for this particular ski mountain. You may mark anywhere on the continuous line.



21. On the following card, how would you evaluate your overall satisfaction in your total skiing experience today?

↑ -Definitely satisfied
| -More satisfied than dissatisfied
5" -Neutral
| -More dissatisfied than satisfied
↓ -Definitely dissatisfied

22. On the following card, how would you evaluate the general maintenance of this ski area?

↑ -Definitely competent
| -More competent than incompetent
5" -Neutral
| -More Incompetent than competent
↓ -Definitely incompetent

23. I am going to name some aspects of maintenance and facilities for this ski area. I'd like for you to say "Yes" if you would like a change, "No" for no change, and tell me if you don't know anything about it.

	Item	Yes	No	Don't Know
1.	Number of Ski Patrol			
2.	Quality of Ski Patrol			
3.	Grooming of Slopes			
4.	Number of Attendants at Lift Lines			
5.	Number of Attendants at Ticket Lines			
6.	Number of Chair Lifts			
7.	Restaurant Facilities			
8.	Parking Facilities			
9.	Variety of Slopes			
10.	Number of slopes			
11.	Number of Ski Instructors			
12.	Quality of Ski Instructors			
13.	Local Roads to the Ski Area			
14.	Local Modes of Transportation Supplied to the Ski Area			

	Yes	No	Don't Know
15. Information Dispersal About Snow Conditions			
16. Would you be interested in the following information dispersal a) Number of skiers at particular areas b) Number of skiers on particular slopes			

24. If the individual was skiing Alpine Springs or Elk Camp, why are you skiing this particular area _____.
(This question was introduced February 1, 1974.)

25. Voluntary complaint of long lift lines_____

Personal Data

1. Sex: Male _____ Female _____

2. How old are you _____

3. What is your permanent place of residence_____

4. How long have you lived at this residence _____

5. Are you a resident of Aspen _____

6. Are you a resident of Colorado _____

7. Are you a part-time resident of Aspen _____

8. Do you own a house _____ or condominium _____ in Aspen

9. What was the last grade you completed in school? Classification: less than high school _____, high school _____, partial college _____, college _____, post graduate _____.

10. What is your occupation _____

11. Approximately, what is your income _____

12. Are you or have you ever been associated with or worked for a ski operation? _____

13. Are you presently a member of a ski club? _____

14. Do any immediate members of your family ski? ____ If so, how many ____ and what is their relation? Brother ____, Sister ____, Wife ____, Husband ____, Children ____, Parents ____, Grandparents ____.
Did your parents ski at any time? _____

15. Are you staying in Aspen for a skiing vacation? _____
Do you plan to return to Aspen sometime in the future? _____
Have you come to Aspen more than once this season? _____

16. Do you have any opinions about this questionnaire?

APPENDIX B

STATISTICAL ANALYSIS OF INTERVIEW BIAS

TABLE I

STATISTICAL RESULTS OF QUESTION 23*
CHI SQUARE

Maintenance or Facility	Interviewer	% Yes	% No	% Don't Know	Raw Chi Square	Degree Freedom	Significance Level
Number of Ski Patrol	Field Assistant	.2	82.0	17.8	127.99	4	< .1%
	Myself	7.3	44.0	48.7			
Quality of Ski Patrol	Field Assistant	.8	81.0	18.2	74.97	4	< .1%
	Myself	2.5	51.3	46.2			
Grooming of Slopes	Field Assistant	9.4	87.5	3.1	2.73	4	6%
	Myself	12.4	85.8	1.8			
# Lift Line Attendants	Field Assistant	1.2	95.5	3.3	9.72	4	4%
	Myself	.7	99.3	0			
# Ticket Line Attendants	Field Assistant	7.4	86.1	6.5	27.95	4	< .1%
	Myself	13.8	70.5	15.6			
Number Chair Lifts	Field Assistant	8.6	88.3	3.1	20.84	4	< .1%
	Myself	19.3	79.6	1.1			
Restaurant Facilities	Field Assistant	8.8	87.5	3.7	33.80	4	< .1%
	Myself	20.7	70.5	8.7			
Parking Facilities	Field Assistant	18.6	73.2	8.2	81.12	4	< .1%
	Myself	28.7	42.9	28.4			
Variety of Slopes	Field Assistant	2.7	93.9	3.5	30.40	4	< .1%
	Myself	12.0	86.9	1.1			

TABLE I (Continued)

Maintenance or Facility	Interviewer	% Yes	% No	% Don't Know	Raw Chi Square	Degree Freedom	Significance Level
Number Slopes	Field Assistant Myself	1.2 9.1	94.7 89.1	4.1 1.8	30.31	4	< .1%
Number of Instructors	Field Assistant Myself	1.4 1.1	68.3 40.0	30.3 58.9	60.75	4	< .1%
Quality Ski Instructors	Field Assistant Myself	1.2 4.0	67.9 36.4	30.9 59.6	73.12	4	< .1%
Local Roads	Field Assistant Myself	6.7 20.4	84.3 63.6	9.0 16.0	45.58	4	< .1%
Quality Ski Instructors	Field Assistant Myself	1.2 4.0	67.9 36.4	30.9 59.6	73.12	4	< .1%
Local Roads	Field Assistant Myself	6.7 20.4	84.3 63.6	9.0 16.0	45.58	4	< .1%
Local Transportation	Field Assistant Myself	5.1 16.0	87.3 66.5	7.6 17.5	48.39	4	< .1%
Information: Snow Conditions	Field Assistant Myself	8.8 27.0	82.0 58.0	9.2 15.0	57.33	4	< .1%

TABLE I (Continued)

Maintenance or Facility	Interviewer	% Yes	% No	% Don't Know	Raw Chi Square	Degree Freedom	Significance Level
Information: # Skiers at Areas	Field Assistant	16.0	78.9	5.1	198.85	4	< .1%
	Myself	66.2	32.4	1.5			
Information: # Skiers on Slopes	Field Assistant	15.1	79.8	5.1	157.20	4	< .1%
	Myself	58.5	40.0	1.5			

*Question 23: Would you like a change in the following aspects of maintenance or facilities?

TABLE II

STATISTICAL RESULTS OF QUESTION 19*
CHI SQUARE

	% Yes	% No	Raw Chi Square	Degrees Freedom	Significance Level
Field Assistant	5.7	94.3	101.62	2	< .1%
Myself	33.3	66.7			

*Question 19: Before you actually skied today, did you think about how many people would be skiing?

TABLE III

STATISTICAL RESULTS OF QUESTION 9 OF PERSONAL DATA*
CHI SQUARE

	% High School	% High School	% Part College	% College	% Post Graduate	Raw Chi Square	Degrees Freedom	Significance Level
Field Assistant	3.3	4.7	24.0	40.5	27.5	48.30	8	< .1%
Myself	16.0	8.0	23.3	32.4	20.4			

*Question 9: Level of education.

TABLE IV

STATISTICAL RESULTS OF QUESTION 14 OF PERSONAL DATA*
CHI SQUARE

	% Yes	% No	Raw Chi Square	Degrees Freedom	Significance Level
Field Assistant	71.3	28.7	43.81	1	< .1%
Myself	39.4	60.6			

*Question 14: Did your parents ski at any time?

TABLE V

STATISTICAL RESULTS OF QUESTION 17*
T-TEST

	Case Numbers	Mean	Standard Deviation	Standard Error	Degrees Freedom	Significance Level
Myself	275	2.93	.84	.05	500.09	< .1%
Field Assistant	490	3.13	.72	.03		

*Question 17: Evaluation of number and distribution of people skiing for the day.

TABLE VI

STATISTICAL RESULTS OF QUESTION 21*

	Case Number	Mean	Standard Deviation	Standard Error	Degrees Freedom	Significance Level
Myself	275	4.12	1.11	.07	442.57	< .1%
Field Assistant	489	4.37	.82	.04		

*Question 21: Evaluation of total satisfaction in skiing experience.

APPENDIX C

STATISTICAL ANALYSIS FOR USER CHARACTERISTICS

TABLE I

AVERAGE USERS/ACRE DIFFERENCES
AMONG ASPEN SKI MOUNTAINS
T-TEST

Mountain	Case Number	Mean	Standard Deviation	Significance Level
Aspen	106	2.92	.85	< .1%
Buttermilk		3.65	1.43	
Aspen	120	2.77	.92	< .1%
Snowmass		3.09	1.13	
Buttermilk	125	3.20	1.70	< .5%
Snowmass		2.90	1.36	

TABLE II

AVERAGE USERS/ACRE DIFFERENCES
AMONG TIME PERIODS
ANALYSIS OF VARIANCE

Time Period	Mean	Standard Deviation	95% Confidence Interval
1	.45	.27	.32
2	3.05	1.35	2.44
3	2.89	.54	2.73
4	4.27	.90	3.70
5	3.71	.73	3.41
6	1.69	.77	1.27

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	Sign. Level
Between Groups	5	173.08	34.62		
Within Groups	133	82.83	.62	55.58	< .1%
Total	138	255.91			

TABLE II (Continued)

Subset*	Time Period(s)	Mean(s)
1	1	.45
2	6	1.64
3	2,3	2.89,3.05
4	5	3.71
5	4	4.27

*Student - Newman - Keuls Post Testing for Analysis of Variance
Significance level = .05

TABLE III

AVERAGE USERS/ACRE DIFFERENCES
ACCORDING TO DAY OF THE WEEK
T-TESTS

Day	Case Number	Mean	Standard Deviation	Significance Level
Weekend	40	2.67	1.41	.931
Weekday	90	2.69	1.35	(Not sig.)
Saturday	20	2.14	1.02	
All Days Except Saturday	199	2.78	1.39	2%

TABLE IV

AVERAGE USERS/ACRE DIFFERENCES
ACCORDING TO TEMPERATURE
T-TESTS

Mountain	Temp. (°F)	Case Numbers	Mean	Standard Deviation	Significance Level
Aspen	> 10	74	3.00		.26
	≤ 10	6	2.59	.76	(Not sig.)
Buttermilk	< 10	87	3.22	1.73	.47
	≥ 10	6	3.50	.79	(Not sig.)
Snowmass	> 10	87	2.96	1.39	.92
	≤ 10	6	2.99	.68	(Not sig.)
All	> 10	87	2.91	1.39	.84
	≤ 10	6	2.97	.64	(Not sig.)

TABLE V

AVERAGE USERS/ACRE DIFFERENCES
ACCORDING TO WINDS
T-TESTS

Mountain	Winds (mph)	Case Numbers	Mean	Standard Deviation	Significance Level
Aspen	< 10	64	2.92	.87	.33
	≥ 10	16	3.16	.87	(Not sig.)
Buttermilk	< 10	77	3.13	1.67	.17
	≥ 10	16	3.78	1.71	(Not sig.)
Snowmass	< 10	77	2.83	1.39	1%
	≥ 10	16	3.59	.95	
All	< 10	77	2.77	1.36	1%
	≥ 10	16	3.60	1.09	

TABLE VI

AVERAGE USERS/ACRE DIFFERENCES
ACCORDING TO SNOW
T-TESTS

Mountain	Snow Conds.	Case Numbers	Mean	Standard Deviation	Significance Level
Aspen	Not snowing	62	3.08	.87	4%
	Snowing	15	2.54	.82	
Buttermilk	Not snowing	72	3.06	1.58	.26
	Snowing	18	3.60	1.83	(Not sig.)
Snowmass	Not snowing	72	3.03	1.41	.27
	Snowing	18	2.67	1.19	(Not sig.)
	Not snowing	72	2.95	1.39	.44
	Snowing	18	2.69	1.25	(Not sig.)

TABLE VII

AVERAGE USERS/ACRE DIFFERENCES
ACCORDING TO WINDS AND SNOW
T-TESTS

Mountain	Snowing & Winds (mph)	Case Numbers	Mean	Standard Deviation	Significance Level
Aspen	< 10	14	2.63	.58	.78
	$\geq$ 10	3	2.88	1.30	(Not sig.)
Buttermilk	< 10	17	4.00	1.95	.89
	$\geq$ 10	3	3.77	2.18	(Not sig.)
Snowmass	< 10	17	2.78	1.16	.86
	$\geq$ 10	3	2.88	.72	(Not sig.)
All	< 10	17	2.83	1.24	.78
	$\geq$ 10	3	3.04	1.04	(Not sig.)

TABLE VIII

AVERAGE USERS/ACRE DIFFERENCES
ACCORDING TO TEMPERATURE AND SNOW
T-TESTS

Mountain	Snowing & Temp. (°F)	Case Number	Mean	Standard Deviation	Significance Level
Aspen	> 10	12	2.71	.69	.78
	≤ 10	5	2.59	.81	(Not sig.)
Buttermilk	< 10	15	3.74	1.95	.42
	≥ 10	5	4.58	1.89	(Not sig.)
Snowmass	> 10	15	2.71	1.22	.41
	≤ 10	5	3.04	.52	(Not sig.)
All	> 10	15	2.75	1.31	.37
	≤ 10	5	3.20	.76	(Not sig.)

TABLE IX

AVERAGE USERS/ACRE DIFFERENCES ACCORDING TO
TEMPERATURE AND WIND
T-TESTS

Mountain	Temperature/Winds (°F) (mph)	Number of Cases	Mean	Standard Deviation	Significance Level
Aspen	≥ 20 and < 10	71	2.99	.87	.58
	< 20 and ≥ 10	9	2.80	.94	(Not sig.)
Buttermilk	≥ 20 and < 10	84	3.11	1.66	.04
	< 20 and ≥ 10	9	4.40	1.59	(5%)
Snowmass	≥ 20 and < 10	84	2.94	1.39	.54
	< 20 and ≥ 10	9	3.16	.99	(Not sig.)
All	≥ 20 and < 10	84	2.86	1.35	.23
	< 20 and ≥ 10	9	3.44	1.30	(Not sig.)

TABLE X

AVERAGE USERS/ACRE DIFFERENCES ACCORDING TO SNOW CONDITION RATING*
T-TESTS

Mountain	Rating	Number of Cases	Mean	Standard Deviation	Significance Level
Aspen	Good, Very Good or Excellent	77	3.01	.85	.17
	Poor or Fair	3	1.93	.88	(Not sig.)
Buttermilk	Good, Very Good or Excellent	77	3.68	1.36	< .1%
	Poor or Fair	16	1.14	1.52	
Snowmass	Good, Very Good or Excellent	77	3.40	.95	< .1%
	Poor or Fair	16	.84	.90	
Total	Good, Very Good or Excellent	77	3.36	.92	< .1%
	Poor or Fair	16	.77	.97	

*Snow conditions for Midway only.

TABLE XI

AVERAGE USERS/ACRE DIFFERENCES ACCORDING TO SNOW CONDITIONS*
T-TESTS

Mountain	Snow Conditions	Number of Cases	Mean	Standard Deviation	Significance Level
Aspen	Powder or Packed Powder	64	2.85	.90	1%
	Hard Packed, Wind Packed, Granular	16	3.46	.55	
Buttermilk	Powder or Packed Powder	70	3.38	1.53	.23
	Hard Packed, Wind Packed, Granular	23	2.80	2.07	(Not sig.)
Snowmass	Powder or Packed Powder	70	3.00	1.28	.71
	Hard Packed, Wind Packed, Granular	23	2.86	1.58	(Not sig.)
All	Powder or Parcked Powder	70	2.98	1.26	.50
	Hard Packed, Wind Packed, Granular	23	2.73	1.61	(Not sig.)

TABLE XII

AVERAGE USERS/ACRE DIFFERENCES ACCORDING TO NEW SNOW CONDITIONS*
T-TESTS

Mountain	New Snow (Inches)	Number of Cases	Mean	Standard Deviation	Significance Level
Aspen	<1	70	2.52	.97	.1%
	≥1	50	3.12	.75	
Buttermilk	<1	64	3.43	1.79	.12
	≥1	61	2.96	1.58	(Not sig.)
Snowmass	<1	78	2.60	1.30	.13
	≥1	61	2.96	1.43	(Not sig.)
Total	<1	78	2.54	1.31	.16
	≥1	61	2.87	1.42	(Not sig.)

*Snow conditions for Midway only.

TABLE XIII

YEARS SKIED IN ASPEN*

Years Skied	Percentage of Skiers
1st	44.7
2-3	28.0
4-5	10.5
6-10	11.1
Over 10	5.7

*Exclude Aspen residents

TABLE XIV

TOTAL YEARS SKIED BY THE INDIVIDUAL

Years Skied	Percentage
1st	7.6
2-3	20.6
4-5	19.8
6-10	26.9
11-15	14.0
Over 16	11.1

TABLE XV
REASONS GIVEN FOR SKIING ASPEN
BASED ON PAST EXPERIENCE

Reason	Percent Response
Best skiing	9.1
Variety of skiing	2.8
Town	3.1
Best skiing and town	3.4
Liked it before	6.2
Area for skiing	.4
Like skiing here	3.4
Less crowds	.7

TABLE XVI

LENGTH OF STAY IN ASPEN

Day	Percent Respondents
1-3	9.5
4-5	8.3
6-7	48.6
8-14	24.7
15-21	3.3
Over 21	5.7

TABLE XVII

AGE OF SKIERS IN ASPEN

Age	Percent Respondents
Less than 18	11.2
18-25	36.0
26-35	33.5
36-50	17.9
Over 50	1.4

TABLE XVIII

COMPLETED EDUCATION OF ASPEN SKIERS

Education	Percent Respondents
Less than High School	11.2
High School	9.4
Partial College	25.4
College	31.9
Post Graduate	22.3

TABLE XIX

OCCUPATION OF ASPEN SKIERS

Occupation	Percent Respondents
Professional and Technical Workers	63.3
Managers and Administrators	18.5
Clerical Workers	4.1
Craftsmen	4.1
Operatives	1.2
Laborers	.7
Service Workers	8.2

TABLE XX

INCOME LEVEL OF ASPEN SKIERS

Income (Dollars)	Percent Aspen Residents	Percent Non-Aspen Residents
Less than 4,999	53.5	10.6
5,000- 9,999	20.8	8.3
10,000-14,999	11.9	22.4
15,000-19,999	4.0	14.1
20,000-24,999	3.0	9.5
25,000-49,999	5.0	19.8
50,000-99,999	2.0	11.5
More than 100,000	None	3.7

Chi Square Test for Income: Aspen Residents Versus Non-Aspen Residents
Raw Chi Square = 118.90; 7 degrees of freedom;
Significance Level <.1%

TABLE XXI

PERMANENT PLACE OF RESIDENCE FOR ASPEN SKIERS*

Region	Nov. 27 Dec. 22	Dec. 23 Jan. 9	Jan. 5- Feb. 16	Feb. 17-28	Mar. 1- Mar. 31	Total
Northwest	9.9	8.8	13.0	6.5	14.7	12.1
Midwest	46.5	43.1	27.5	35.5	36.7	36.8
Southwest	12.7	17.6	10.9	6.5	4.1	9.5
South	8.5	7.8	8.7	3.2	11.0	9.1
West	14.1	15.7	29.0	18.4	19.7	20.5
Mid-Atlantic	5.6	3.9	5.1	19.4	8.3	7.0
Northwest	None	1.0	None	None	.5	.4
Foreign**	2.8	2.0	5.8	9.7	5.0	4.6

Chi Square Test for Residency and Time Periods
Raw Chi Square = 50.26; 28 degrees of freedom; Significance level <.1%

*Excludes Aspen residents

**Includes Hawaii and Alaska

TABLE XXII

CITY SIZE FOR ASPEN SKIERS*

City Size	Percent Respondents
More than 5,000,000	22.8
1,000,000 - 5,000,000	31.8
500,000 - 1,000,000	6.9
250,000 - 500,000	5.7
100,000 - 250,000	8.4
50,000 - 100,000	5.2
25,000 - 50,000	3.8
10,000 - 25,000	5.2
5,000 - 10,000	2.5
2,500 - 5,000	2.3
1,000 - 2,500	1.7
Less than 1,000	2.9

*Excludes Aspen residents.

TABLE XXIII

AGE OF THOSE WHO HAVE CHILDREN THAT SKI

Age	Percent Respondents
Less than 18	None
18 - 25	.8
26 - 35	30.5
36 - 50	59.4
More than 50	9.3

APPENDIX D

STATISTICAL ANALYSIS OF SKIERS' EVALUATIONS OF USE IN RELATION TO LOCATION, TIME AND WEATHER AND SNOW CONDITIONS

TABLE I

DIFFERENCES IN EVALUATION OF USE BY EACH MOUNTAIN
ANALYSIS OF VARIANCE

Mountain	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
Aspen	192	3.13	.90	3.00 to 3.26
Buttermilk	227	2.55	.69	2.46 to 2.64
Snowmass	268	2.86	.86	2.76 to 2.96

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	2	34.72	17.36	25.96	.1%
Within Groups	684	457.42	.67		
Total	686	492.14			

Student-Newman-Keuls Post Testing for Analysis of Variance
Significance Level = .05

Subset	Mountain	Mean
1	Buttermilk	2.55
2	Snowmass	2.86
3	Aspen	3.13

TABLE II

DIFFERENCES IN EVALUATION OF USE BY LIFTS
ON EACH MOUNTAIN
ANALYSIS OF VARIANCE

Lifts	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
1A	16	3.00	.82	2.57 to 3.44
2	28	3.23	.92	2.88 to 3.59
3	37	3.11	.84	2.83 to 3.39
4	18	3.33	.89	2.89 to 3.78
5	19	2.71	1.11	2.17 to 3.24
8	18	3.14	1.03	2.63 to 3.65

TABLE II (Continued)

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	5	4.62	.92	1.07	.38
Within Groups	130	111.82	.86		(Not sig.)
Total	135	116.43			

Buttermilk

Lifts	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
1	35	2.56	.69	2.32 to 2.80
2	11	2.77	.61	2.37 to 3.18
3	42	2.39	.71	2.17 to 2.61
4	22	2.34	.47	2.13 to 2.55

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	3	1.89	.63	1.47	.29
Within Groups	106	45.53	.43		(Not sig.)
Total	109	47.42			

Snowmass

Lifts	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
1, 2, 3	73	2.85	.87	2.65 to 3.06
4	27	2.65	.62	2.40 to 2.89
6, 7, 9	38	2.61	1.01	2.27 to 2.94
8, 11	33	3.09	.74	2.83 to 3.35
5	4	2.25	.50	1.45 to 3.05

TABLE II (Continued)

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	4	6.26	1.57	2.21	7%
Within Groups	170	120.61	.70		
Total	174	126.87			

TABLE III

DIFFERENCES IN EVALUATION OF USE ACCORDING TO TIME FOR EACH MOUNTAIN ANALYSIS OF VARIANCE

Time Period	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
		All Mountains		
1	115	2.04	.75	2.26 to 2.54
2	119	2.72	.78	2.58 to 2.86
3	178	2.87	.77	2.76 to 2.99
4	36	3.21	.98	2.88 to 3.54
5	203	3.03	.90	2.91 to 3.16
6	36	2.90	.67	2.67 to 3.13

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	5	36.41	7.28	10.88	<.1%
Within Groups	681	455.73	.67		
Total	686	494.14			

Student-Newman-Keuls Post Testing for Analysis of Variance Significance Level = .05

Subset	Time Period(s)	Mean(s)
1	1	2.40
2	2, 3, 6	2.72, 2.89, 2.90 respectively
3	3, 6, 5, 4	2.87, 2.90, 3.03, 3.21 respectively

TABLE III (Continued)

Time Period	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
		Aspen Mountain		
2	35	2.85	.72	2.60 to 3.08
3	55	3.13	.86	2.90 to 3.36
4	24	3.48	.93	3.09 to 3.87
5	64	3.13	1.05	2.87 to 3.39
6	14	3.21	.43	2.97 to 3.46

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	4	5.80	1.45	1.83	.13
Within Groups	187	148.35	.79		(Not sig.)
Total	191	154.15			

Time Period	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
		Buttermilk		
1	53	2.37	.76	2.16 to 2.58
2	54	2.56	.75	2.35 to 2.76
3	67	2.57	.57	2.43 to 2.71
4	6	2.50	1.05	1.40 to 3.60
5	47	2.74	.61	2.57 to 2.92

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	4	3.57	.89	1.91	.11
Within Groups	222	103.79	.47		(Not sig.)
Total	226	107.37			

TABLE III (Continued

Time Period	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
		Snowmass		
1	62	2.43	.75	2.24 to 2.62
2	30	2.87	.88	2.54 to 3.20
3	56	2.98	.79	2.77 to 3.19
4	6	2.83	.75	2.04 to 3.62
5	92	3.11	.89	2.92 to 3.29
6	22	2.70	.73	2.38 to 3.03

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	5	18.49	3.70	5.46	<.1%
Within Groups	262	177.42	.68		
Total	267	195.91			

Student-Newman-Keuls Test for Analysis of Variance
Significance = .5

Subset	Time Period(s)	Mean(s)
1	1, 6, 4, 2	2.43, 2.70, 2.83, 2.87 respectively
2	6, 4, 2, 3, 5	2.70, 2.83, 2.87, 2.98, 3.11 respectively

TABLE IV

DIFFERENCES IN EVALUATION OF USE BY DAY OF THE WEEK
T-TEST

Day	Case Numbers	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Saturday	92	2.61	.71	136.62	1.49	.2%
All other days	595	2.87	.86			

TABLE V

DIFFERENCES IN EVALUATION OF USE BY TIME OF DAY
ANALYSIS OF VARIANCE

Hour	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
1	65	2.31	.69	2.14 to 2.48
2	102	2.68	.79	2.52 to 2.83
3	122	2.95	.85	2.80 to 3.11
4	101	2.76	.79	2.61 to 2.92
5	89	2.72	.79	2.55 to 2.89
6	78	2.86	.81	2.68 to 3.04
7	57	3.02	.79	2.81 to 3.23
8	10	3.20	.95	2.52 to 3.88

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	7	24.99	3.57	5.59	<.1%
Within Groups	616	393.09	.64		
Total	623	418.08			

Student-Neuman-Keuls Post Testing for Analysis of Variance
Significance Level = .05

Subset	Hour	Mean(s)
1	1	2.31
2	2, 5, 4 6, 3, 7, 8	2.68, 2.72, 2.76, 2.86, 2.95, 3.01, 3.20

TABLE VI

DIFFERENCES IN EVALUATION OF USE BY WEATHER CONDITIONS
T-TESTS

Temperature	Case Nos.	Mean	Standard Deviation	F Value	Degrees Freedom	Sig. Level
>10°F	635	2.85	.86	1.59	65.01	5%
≤10°F	52	2.64	.65			
Winds						
>20 mph	22	2.91	.81	1.09	22.55	.66
≤20 mph	665	2.83	.85			(Not sig.)
Snow						
Not snowing	549	2.85	.86	1.18	225.62	.16
Snowing	138	2.75	.76			(Not sig.)
Winds and Snowing						
Winds >10 mph	20	2.45	.69	1.35	28.48	5%
Winds ≤10 mph	118	2.79	.80			
Temperature and Snowing						
Temp. >10°F	133	2.76	.80	2.12	4.66	.28
Temp. ≤10°F	5	2.40	.55			(Not sig.)
Winds and Temperature						
Winds <10 mph & Temp. <20°F	26	2.69	.79	1.16	27.33	
Winds ≥10 mph & Temp ≤20°F	661	2.84	.85			

TABLE VII

DIFFERENCES IN EVALUATION OF USE BY SNOW CONDITIONS AT EACH MOUNTAIN*
T-TESTS

Aspen Mountain

Snow Condition Rating	Case Nos	Mean	Standard Deviation	F Value	Degrees Freedom	Sig. Level
Good, Very Good, or Excellent	183	3.13	.91	1.31	9.06	.89
Fair or Poor	9	3.17	.70			(Not sig.)
Base						
>30"	171	3.13	.90	1.02	25.27	.96
<30"	21	3.12	.89			(Not sig.)

Buttermilk

Snow Condition Rating	Case Nos	Mean	Standard Deviation	F Value	Degrees Freedom	Sig. Level
Good, Very Good, or Excellent	164	2.62	.67	1.19	104.53	2%
Fair or Poor	63	2.37	.72			
Base						
>15"	136	2.65	.67	1.08	187.67	1%
<15%	91	2.41	.70			

*Snow conditions for Midway only.

TABLE VII (Continued)

Snowmass

Snow Condition Rating	Case Nos.	Mean	Standard Deviation	F Value	Degrees Freedom	Sig. Level
Good, Very Good, or Excellent	197	2.97	.84	1.03	125.46	.1%
Fair or Poor	71	2.56	.83			
Base						
>25"	168	2.99	.84	1.04	204.87	.2%
<25"	100	2.65	.85			

All Mountains

Snow Conditions	Case Nos.	Mean	Standard Deviation	F Value	Degrees Freedom	Sig. Level
Hard Packed, Wind Packed, Granular Packed	186	2.77	.92	1.27	299.71	.28
Powder or Powder	501	2.86	.82			(Not sig.)

APPENDIX E

STATISTICAL ANALYSIS OF SKIERS' EVALUATION OF USE IN RELATION TO USER CHARACTERISTICS

TABLE I

DIFFERENCES IN EVALUATION OF USE ACCORDING TO AGE
T-TEST

Age	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
>30 yr.	260	2.72	.83	558.72	1.06	.5%
<30 yr.	427	2.90	.85			

TABLE II

DIFFERENCES IN EVALUATION OF USE ACCORDING TO SEX
T-TEST

Sex	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Male	468	2.79	.85	427.32	1.02	6%
Female	218	2.92	.84			

TABLE III

DIFFERENCES IN EVALUATION OF USE ACCORDING
TO MARITAL STATUS
T-TEST

Marital Status	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Married, Divorced Other	270	2.81	.85	574.28	1.00	.57 (Not sig.)
Single	417	2.85	.85			

TABLE IV

DIFFERENCES IN EVALUATION OF USE ACCORDING TO INCOME
T-TEST

Income (Dollars)	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Value
>10,000	306	2.77	.85	648.66	1.03	.09
≤10,000	381	2.88	.84			(Not sig.)

TABLE V

DIFFERENCES IN EVALUATION OF USE ACCORDING TO EDUCATION

Level of Education	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
< High School	77	2.86	.87	2.66 to 3.05
High School	62	2.86	.85	2.65 to 3.08
Partial College	175	2.82	.85	2.69 to 2.94
College	220	2.85	.86	2.74 to 2.94
Post-Graduate	152	2.80	.83	2.66 to 2.93

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	4	.46	.12	.16	.96
Within Groups	681	491.65	.72		(Not sig.)
Total	685	492.11			

TABLE VI

DIFFERENCES IN EVALUATION OF USE ACCORDING TO OCCUPATION
ANALYSIS OF VARIANCE

Occupation	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
Prof.-Tech.	434	2.82	.82	2.75 to 2.90
Mgr.-Admin.	127	2.89	.89	2.74 to 3.05
Cler.-Kindred	28	2.96	.96	2.59 to 3.34
Craftsman and Kindred	28	2.70	.66	2.44 to 2.95
Operatives	8	2.94	1.15	1.98 to 3.90
Laborers	5	2.90	.74	1.98 to 3.82
Service Workers	56	2.77	.97	2.51 to 3.03

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	6	2.51	.36	.50	.84
Within Groups	679	489.63	.72		(Not sig.)
Total	685	492.14			

TABLE VII

DIFFERENCES IN EVALUATION OF USE ACCORDING TO RESIDENCY
T-TESTS

Aspen Residency	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Aspen	559	2.84	.84	182.33	1.12	.65
Non-Aspen	128	2.80	.89			(Not sig.)
Part-time Aspen Resident*						
Non-Aspen	552	2.86	.83	40.23	1.24	.09
Part-time Resident	37	2.59	.92			(Not sig.)

TABLE VII (Continued)

Colorado Residency	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Non-Colorado	504	2.83	.85	328.77	1.04	.92
Colorado	183	2.83	.84			(Not sig.)

*Excludes Aspen residents.

TABLE VIII

DIFFERENCES IN EVALUATION OF USE ACCORDING TO LEVEL OF URBANIZATION
ANALYSIS OF VARIANCE

Level of Urbanization	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
≥ 5,000,000	120	2.73	.95	2.56 to 2.90
1,000,000 - 4,999,999	165	2.89	.83	2.77 to 3.02
500,000 - 999,999	35	2.63	.53	2.45 to 2.81
250,000 - 499,999	31	2.89	.82	2.59 to 3.19
100,000 - 249,999	46	2.80	.84	2.55 to 3.05
50,000 - 99,999	27	3.19	.67	2.92 to 3.45
25,000 - 49,999	20	2.65	.59	2.38 to 3.92
10,000 - 24,999	27	2.93	.92	2.56 to 3.29
5,000 - 9,999	13	2.77	1.07	2.12 to 3.42
2,500 - 4,999	132	2.79	.88	2.64 to 2.94
1,000 - 2,499	9	2.91	.72	2.36 to 3.47
<1,000	16	2.81	.75	2.41 to 3.21

TABLE VIII (Continued)

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	11	7.96	.72	1.02	.43
Within Groups	629	448.16	.71		(Not sig.)
Total	640	456.12			

TABLE IX

DIFFERENCES IN EVALUATION OF USE ACCORDING TO MILES TRAVELED TO ASPEN
ANALYSIS OF VARIANCE

Miles	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
0 - 499	192	2.80	.84	2.69 to 2.92
500 - 999	41	2.95	.83	2.69 to 3.21
1,000 - 1,499	246	2.84	.82	2.74 to 2.94
1,500 - 1.999	77	2.78	.83	2.60 to 2.97
2,000 - 2,499	123	2.83	.92	2.64 to 3.00
>2,500	6	3.00	1.22	1.48 to 4.52

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	5	2.41	.35	.48	.85
Within Groups	677	489.67	.72		(Not sig.)
Total	682	492.08			

TABLE X

DIFFERENCES IN EVALUATION OF USE ACCORDING TO TECHNICAL SKIING ABILITY
ANALYSIS OF VARIANCE

Technical Ability	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
Beginner	70	2.77	.77	2.59 to 2.96
Advanced Beginner	39	2.77	.72	2.53 5o 3.00
Intermediate	258	2.79	.82	2.69 to 2.89

TABLE X (Continued)

Technical Ability	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
Advanced Intermediate	101	2.97	.89	2.79 to 3.14
Advanced	185	2.77	.86	2.65 to 2.90
Expert	33	3.32	.97	2.98 to 3.66

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	5	11.14	2.23	3.15	.8%
Within Groups	680	480.97	.71		
Total	685	492.11			

TABLE XI

DIFFERENCES IN EVALUATION OF USE ACCORDING TO SKI CLUB MEMBERSHIP
T-TEST

Membership	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Yes	162	2.76	.83	273.33	1.05	.23
No	525	2.85	.85			(Not sig.)

TABLE XII

DIFFERENCES IN EVALUATION OF USE ACCORDING TO SIZE OF SKI PARTY
ANALYSIS OF VARIANCE

Number Skiers in Party	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
1-2	237	2.78	.86	2.67 to 2.89
3-5	167	2.86	.82	2.74 to 2.99
>5	119	2.90	.84	2.75 to 3.06

TABLE XII (Continued)

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	2	1.33	.67	.94	.39
Within Groups	520	370.99	.71		(Not sig.)
Total	522	372.33			

TABLE XIII

DIFFERENCES IN EVALUATION OF USE ACCORDING TO TYPE OF SKI PASS
T-TESTS

Ski Pass	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Season	67	2.68	.86	80.54	1.03	.13
All other	620	2.85	.85			(Not sig.)
Ski Pass						
All Season Type	159	2.81	.87	252.65	1.08	.70
All Daily Type	528	2.84	.84			(Not sig.)

TABLE XIV

DIFFERENCES IN EVALUATION OF USE ACCORDING TO PARTICIPATION IN OTHER WINTER SPORTS
T-TESTS

Participation	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Yes	287	2.96	.90	568.93	1.28	.1%
No	399	2.74	.80			
All except ice skating	151	2.93	.93	238.77	1.35	3%
No	399	2.74	.80			

TABLE XIV (Continued)

Participation	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Level	Sig. Level
All except snowmobiling	275	2.96	.90	539.44	1.29	.1%
No	399	2.74	.80			
Yes for cross-country ski	181	2.99	.88	301.20	1.13	.4%
No for cross-country ski	506	2.78	.83			

TABLE XV

DIFFERENCES IN EVALUATION OF USE ACCORDING TO TOTAL YEARS SKIED ANALYSIS OF VARIANCE

Total Years	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
1-2	115	2.78	.73	2.64 to 2.91
3-5	213	2.82	.92	2.70 to 2.94
6-10	185	2.83	.80	2.72 5o 2.95
10	174	2.88	.87	2.75 to 3.01

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	3	.76	.25	.35	.79
Within Groups	683	491.38	.72		(Not sig.)
Total	696	492.14			

TABLE XVI

DIFFERENCES IN EVALUATION OF USE ACCORDING TO TOTAL YEARS SKIED IN ASPEN
ANALYSIS OF VARIANCE

Total Years	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
1-2	414	2.84	.82	2.77 to 2.92
3-5	147	2.83	.84	2.69 to 2.97
6-10	83	2.70	.91	2.50 to 2.90
>10	42	2.98	1.01	2.66 to 3.29

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	3	2.31	.77	1.07	.36
Within Groups	682	489.80	.72		(Not sig.)
Total	685	492.11			

TABLE XVII

DIFFERENCES IN EVALUATION OF USE ACCORDING TO ANY SKIING EXPERIENCE IN AREA OF COUNTRY
T-TESTS

Total Days	Case Numbers	Mean	Standard Deviation	95% Confidence Interval
1-3	306	2.79	.84	2.70 to 2.89
4-7	239	2.81	.81	2.71 to 2.91
8-14	59	2.83	.80	2.62 to 3.04
15-21	27	3.03	.94	2.66 to 3.41
22-99	54	3.06	1.02	2.79 to 3.34

Source	Degrees Freedom	Sum of Squares	Mean Squares	F Ratio	Significance Level
Between Groups	4	4.63	1.16	1.62	.17
Within Groups	680	485.45	.71		(Not sig.)
Total	684	490.08			

TABLE XVIII

DIFFERENCES IN EVALUATION OF USE ACCORDING TO ANY SKIING EXPERIENCE IN AREA OF COUNTRY
T-TESTS

Area	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Northwest						
Yes	246	2.86	.90	463.79	1.24	.47
No	440	2.81	.81			(Not sig.)
Midwest						
Yes	245	2.86	.85	503.70	1.00	.53
No	442	2.82	.85			(Not sig.)
California						
Yes	144	3.00	.93	250.43	1.27	.52
No	313	2.94	.82			(Not sig.)

TABLE XIX

DIFFERENCES IN EVALUATION OF USE ACCORDING TO AREA OF THE COUNTRY WHERE MOST SKIING EXPERIENCE HAS TAKEN PLACE
T-TESTS

Area	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
California	51	2.83	.74	61.26	1.34	.99
All other states	636	2.83	.86			(Not sig.)
All other states	584	2.83	.83	132.49	1.24	.67
Northeast	103	2.87	.93			(Not sig.)
All other states	569	2.82	.85	167.17	1.04	.55
Midwest	118	2.88	.86			(Not sig.)
All other states	278	2.82	.84	590.35	1.02	.53
N.E., M.W., California	409	2.86	.85			(Not sig.)

TABLE XX

DIFFERENCES IN EVALUATION OF USE ACCORDING TO WHETHER PARENTS (HAD) SKIED
T-TESTS

Parents Skied	Case Nos.	Mean	Standard Deviation	Degrees Freedom	F Value	Sig. Level
Yes	249	2.94	.83	529.79	1.06	.8%
No	431	2.77	.85			

TABLE XXI

CORRELATION OF MOTIVATION AND EVALUATION OF USE -- SIMPLE CORRELATION

Motivation	r Value	Case Numbers	Significance Level
Physical exercise	.01	686	.39
Challenge of sport	.002	686	.48
Enjoy outdoor surroundings	- .02	686	.32
Being with family or friends	- .005	686	.45
Meet new people	.08	686	.01 (1%)
Enjoy après ski activity	.04	686	.16
Current popular sport	- .05	686	.09

TABLE XXII

CORRELATIONS AMONG MOTIVATIONS
SIMPLE CORRELATIONS

	Challenge of Sport	Being with Family Friends	Enjoy Outdoors	Meet People	Physical Exercise	Après Ski Activity	Popular Sport	
Challenge of Sport	1.0	-.02 (.32)	.11 (.002)	.17 (.001)	.19 (.001)	.15 (.001)	.04 (.15)	r value sig.lev.
Being with Family or Friends			.18 (.001)	.13 (.001)	.08 (.02)	.09 (.007)	.05 (.08)	
Enjoy Outdoor Surroundings				.21 (.001)	.19 (.001)	.04 (.13)	.01 (.42)	
Meet New People					.21 (.001)	.38 (.001)	.21 (.001)	
Physical Exercise						.13 (.001)	.04 (.13)	
Enjoy Après Ski Activ.							.25 (.001)	
Current Popular Sport							1.0	

APPENDIX F

STATISTICAL ANALYSIS OF RESOURCE QUALITY IN RELATION TO SKIERS' EVALUATION OF USE

TABLE I

REQUESTED CHANGE IN THE NUMBER OF CHAIR LIFTS AND TIME OF REQUEST CHI SQUARE

Time Period	Yes (Percent)	No (Percent)	Don't Know (Percent)	Total (Percent)
1	6.9	89.7	3.4	17.0
2	18.6	79.7	1.7	17.3
3	17.3	81.6	1.1	26.2
4	19.4	80.6	0	5.3
5	30.7	68.3	1.0	29.1
6	33.3	61.1	5.6	5.3
Total	20.6	77.6	1.8	100.0

Raw Chi Square = 38.98
Degrees Freedom = 10
Significance Level <.1%

TABLE II

REQUESTED CHANGE IN THE NUMBER OF CHAIR LIFTS AND TIME OF REQUEST FOR EACH MOUNTAIN CHI SQUARES

Time Period	Yes (Percent)	No (Percent)	Total (Percent)
Aspen Mountain			
1	-	-	-
2	31.4	68.6	18.5
3	23.6	76.4	29.1
4	20.8	79.2	12.7
5	36.5	63.5	33.3
6	58.3	41.7	6.3
Total	31.2	68.8	100.0

Raw Chi Square = 7.61
Degrees Freedom = 4
Significance Level = .11 (Not sig.)

TABLE II (Continued)

Time Period	Yes (Percent)	No (Percent)	Total (Percent)
Buttermilk			
1	3.8	96.2	24.0
2	5.7	94.3	24.0
3	9.2	90.8	29.4
4	0	100.0	2.7
5	13.6	86.4	19.9
6	-	-	-
Total	7.7	92.3	100.0
Raw Chi Square = 4.36			
Degrees Freedom = 4			
Significance Level = .36 (Not sig.)			
Snowmass			
1	10.2	89.8	22.5
2	28.6	71.4	10.7
3	21.1	78.9	21.8
4	33.3	66.7	2.3
5	35.6	64.7	34.4
6	22.7	77.3	8.4
Total	24.8	75.2	100.0
Raw Chi Square = 13.29			
Degrees Freedom = 5			
Significance Level = 2%			

TABLE III

REQUESTED CHANGE IN MOUNTAIN RESTAURANTS
AND TIME OF REQUEST
CHI SQUARE

Time Period	Yes (Percent)	No (Percent)	Don't Know (Percent)	Total (Percent)
1	20.7	69.8	9.5	17.0
2	22.0	70.3	7.6	17.3
3	19.0	72.6	8.4	26.2
4	19.4	66.7	13.9	5.3
5	20.1	66.3	13.6	29.1
6	19.4	72.2	8.3	5.3
Total	20.2	69.6	10.2	100.0

Raw Chi Square = 5.20
Degrees Freedom = 10
Significance Level = .88 (Not sig.)

TABLE IV

REQUESTED CHANGE IN PARKING FACILITIES
AND TIME OF REQUEST
CHI SQUARE

Time Period	Yes (Percent)	No (Percent)	Total (Percent)
1	20.0	80.0	18.8
2	33.0	67.0	18.6
3	40.3	59.7	25.5
4	36.0	64.0	5.0
5	47.8	52.2	26.5
6	46.4	53.6	5.5
Total	37.2	62.8	100.0

Raw Chi Square = 20.71
Degrees Freedom = 5
Significance Level <.1%

TABLE V

REQUESTED CHANGE IN PARKING FACILITIES AND TIME OF REQUEST FOR EACH MOUNTAIN CHI SQUARE

Time Period	Yes (Percent)	No (Percent)	Total (Percent)
Aspen Mountain			
1	-	-	-
2	65.4	34.6	18.8
3	62.5	37.5	29.0
4	60.0	40.0	10.9
5	71.7	28.3	33.3
6	63.6	36.4	8.0
Total	65.9	34.1	100.0
Raw Chi Square = 1.16			
Degrees Freedom = 4			
Significance Level = .88 (Not sig.)			
Buttermilk			
1	15.7	84.3	28.7
2	15.9	84.1	24.7
3	21.6	78.4	28.7
4	0	100.0	2.8
5	18.5	81.5	15.2
6	-	-	-
Total	17.4	82.6	100.0
Raw Chi Square = 1.86			
Degrees Freedom = 4			
Significance Level = .76 (Not sig.)			
Snowmass			
1	25.0	75.0	23.3
2	29.2	70.8	12.7
3	42.1	57.9	20.1
4	0	100.0	2.6
5	42.6	57.4	32.3
6	35.3	64.7	9.0
Total	34.9	65.1	100.0
Raw Chi Square = 7.39			
Degrees Freedom = 5			
Significance Level = .19 (Not sig.)			

TABLE VI

CORRELATION OF THE EVALUATION OF FACILITIES
AND THE PERCEPTION OF USE
SIMPLE CORRELATION

Facility	r Value	Case Numbers	Significance Level
Number of Slopes	-.02	682	.29
Slope Terrain	-.01	681	.38
Snow Conditions	.07	683	3%
Variety of Slopes	.05	679	.09
Number of Lifts	-.08	673	2%
General Maintenance	-.003	682	.47

TABLE VII

CORRELATION OF EVALUATION OF USE AND USER CHARACTERISTICS
AND RESOURCE QUALITY
MULTIPLE CORRELATION

Variable	Multiple r	r Square	Simple r
Snow (powder)	.05	.00	.05
Maintenance Evaluation	.05	.00	.00
Motivation: Meet New People	.16	.01	.10
Days Skied in Aspen	.21	.05	.18
Total Resorts Skied	.22	.05	.05
Cost to Stay in Aspen Evaluation	.22	.05	-.02
Motivation: Being with Family/Friends	.23	.05	-.06
Motivation: Challenge of Sport	.23	.05	-.07
Education Level	.24	.06	.02
Size of Party Skiing	.26	.07	.09
Evaluation: Number of Slopes	.27	.07	-.05
Motivation: Current Popular Sport	.32	.10	-.16
Motivation: Enjoy Outdoors	.33	.11	-.03
Years Skied in Aspen	.33	.11	.07
Number of People Skiing in Family	.33	.11	.00
Motivation: Physical Exercise	.33	.11	-.01
Motivation: Enjoy Après Ski Activity	.33	.11	.01

TABLE VII (Continued)

Variable	Multiple r	r Square	Simple r
Evaluation: Number of Lifts	.35	.12	-.12
Age	.36	.13	-.10
Evaluation: Snow Conditions	.39	.15	.14
Technical Skiing Ability	.39	.15	.10
Evaluation: Variety of Slopes	.41	.17	.11
Total Years Skied	.42	.17	.10
Income	.42	.18	-.12
Evaluation: Slope Terrain	.43	.18	-.01

Multiple r = .43
r Square = .18
Standard Deviation = .82
Significance <.1%

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A stylized "ankh," the ancient
Egyptian sign for life, has been
incorporated into the symbol of
the Program on Man and the Biosphere (MAB).