

*Colorado River Trips Within the Grand Canyon National
Park and Monument: A Socio-Economic Analysis*



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Technical Reports on
Natural Resource Systems



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AND MONUMENT: A SOCIO-ECONOMIC ANALYSIS

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Natural Resource Systems
Report No. 10

June 1972

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PREFACE

This report constitutes the master's thesis of the same title completed by the author in June, 1972 and accepted by the Department of Hydrology and Water Resources. The investigation was conducted under the direction of Russell L. Gum, Associate Professor, Department of Hydrology and Water Resources.

This report series constitutes an effort to communicate to practitioners and researchers the complete research results, including economic foundations and detailed theoretical development that cannot be reproduced in professional journals. These reports are not intended to serve as a substitute for the review and referee process exerted by the scientific and professional community in these journals. The author, of course, is solely responsible for the validity of the statements contained herein. A complete list of currently-available reports may be found in the back of this report.

ACKNOWLEDGMENTS

This research was supported by a grant from the Grand Canyon Natural History Association.

The author wishes to express his sincere thanks to Professor Russell L. Gum, Department of Hydrology and Water Resources, for his professional guidance and thoughtful criticisms during the preparation of this thesis.

Special thanks go to Professor D. D. Evans, Head of the Department of Hydrology and Water Resources, who served as chairman of the author's graduate committee, and to Professor David King, Department of Watershed Management, who was a member of the author's committee and whose comments about the thesis were very helpful.

David Monarchi, a Research Specialist in the Division of Economic and Business Research, provided invaluable assistance with Cluster Analysis.

Several other persons have given valuable assistance and advice concerning this work. David Ochsner and Warren Hill of the U. S. National Park Service worked closely with the author throughout the project and contributed much technical advice. William Diamond and Robert Elliott represented the Colorado River Outfitters Association during the early stages of the research. Sanderson Brothers River Expeditions enabled the author to develop

a better understanding of river trips by permitting him to accompany one of their groups.

The writer wishes to express his appreciation to the National Science Foundation for an appointment as a Trainee in Water Resources Administration.

Finally, the author would like to express his gratitude to The University of Arizona Computer Center for the use of their facilities.

TABLE OF CONTENTS

	Page
LIST OF TABLES	vii
LIST OF ILLUSTRATIONS	ix
ABSTRACT	x
 CHAPTER	
I. INTRODUCTION	1
The Development of River Trips	2
Popularity of River Trips	3
Objectives of Study	6
Description of Thesis	6
II. METHOD OF STUDY	8
Questionnaire Development	9
Questionnaire Format	10
Selection of the Random Sample	11
Method of Analysis	13
III. RESULTS OF STUDY	15
Socio-Economic Characteristics	15
The Trip as an Experience	18
The Trip's Importance to the Users	18
Appreciation of the Trip	21
The Trip Experience	23
Individual Trip Management	30
Crowding?	34
IV. CLUSTER ANALYSIS RESULTS	40
What is Cluster Analysis?	40
Variable Analysis	41
Object Analysis	42
Applicability to Colorado River	
Trips' Data	43
Cluster Analysis on Outdoor Activities	43
Cluster Analysis on "Yes-No"	
Questions	48

TABLE OF CONTENTS--Continued

	Page
Cluster Analysis on "True-False"	
Questions	51
Management Implications	55
V. CONCLUSIONS	56
The People	56
Management Considerations	57
GLOSSARY	60
APPENDIX A. INTRODUCTORY LETTER AND QUESTIONNAIRE	62
APPENDIX B. ADDITIONAL DATA TABLES NOT PRESENTED IN THE TEXT	68
APPENDIX C. INTERIM CARRYING CAPACITY AND MANAGEMENT GUIDELINES FOR COLORADO RIVER TRIPS	82
APPENDIX D. A COMPARISON OF INCOME LEVELS OF COLORADO RIVER PARTICIPANTS TO THE SEVEN NATIONAL RECREATION AREAS	83
REFERENCES	84

LIST OF TABLES

Table	Page
1. Yearly Distributions of People Receiving Questionnaires	12
2. Questionnaire Response Rates by Year	13
3. Outdoor and Vacation Activities in which "River-Runners" Commonly Engage	17
4. Sources of Information About River Trips	20
5. Intensity of Friendships Made on River Trips	21
6. Trip Enjoyment vs. Perception of Weather	22
7. Changes in "Before" and "After" Responses of the "True-False" Questions	25
8. Ranking of the "True-False" Questions According to Those That Contributed "Most" and "Least" to the Trip Experience	31
9. Individual Reactions to Different Size River Trips	36
10. Reactions to Seeing Other Groups on the River	36
11. Clusters Defined on Outdoor Activities	45
12. Clusters Defined on the "Yes-No" Questions	49
13. Clusters Defined on the "True-False" Questions	53
14. Individual Outfitter Representation in the Sample	69
15. Age Distribution for Colorado River Trips	70

LIST OF TABLES--Continued

Table	Page
16. Occupational Data	71
17. Student Grade Distribution	71
18. Number of Rowing Trips by Individuals in the Sample	72
19. Number of Days of Last Trip	72
20. Length of Anticipatory Period for River Trip	73
21. Classification of the Weather	73
22. Vacation Time Distribution for Employed and Self-Employed Respondents	74
23. Monthly Distribution of River Trips	75
24. Perception of Trip Enjoyment	76
25. Number of Trips taken by Individuals in the Sample	76
26. Results of "Yes-No" Questions	77
27. Results of the "True-False" Questions	80

LIST OF ILLUSTRATIONS

Figure	Page
1. Grand Canyon Section of Colorado River Covered by River Trips	5
2. O-type Profiles on Outdoor Activities	46
3. O-type Profiles on "Yes-No" Questions	50
4. O-type Profiles on "True-False" Questions	54

ABSTRACT

The recreational use of the Colorado River within the Grand Canyon National Park and National Monument increased on the order of 60 to 70 per cent during each year of the interval 1967 to 1970. Consequently, the U. S. National Park Service instituted user limits to protect and preserve the area commencing with the 1971 season. This limit was established with limited data on the users of the river or about their perceptions of the trip experience. A need existed to collect and analyze this type of data, and to suggest possible management alternatives.

This study used a mailed questionnaire to a random sample of past participants in order to collect basic socio-economic data. The analysis was based on a 65% response rate, and consisted of individual question tabulation and multivariate data-cluster analysis.

The data show background characteristics of the participants, reasons for taking the trip, reactions to the experience, perceptions of problems associated with the trips, reactions to crowded conditions, and needs for regulatory policy concerning user intensities.

CHAPTER I

INTRODUCTION

Recent increases in the use of the Colorado River for river trips through the Grand Canyon National Park and Monument have led to observations that the environmental carrying capacity¹ for the area has been reached, causing a possible quality degradation in this unique recreational experience. In response, both the National Park Service and the Colorado River Outfitters Association have adopted new policies to improve the quality of the trip, and to protect this valuable amenity for future generations. However, information on which to base policy is severely limited at this time. Consequently, there is a need to gain a greater awareness and understanding of visitor expectations, perceptions, interactions, and satisfactions and dissatisfactions.

The environmental carrying capacity of a recreational area is dependent upon both the social and the biological carrying capacities for the area, and is generally taken as the minimum of the two. Thus, management decisions should only be made with some knowledge and

1. Kormondy (1969) defines the environmental carrying capacity as the limit at which the environment can support a population.

understanding of both factors. This study will only deal with factors relating to the social carrying capacity of the Colorado River, and the results should be used only in conjunction with those from biological studies of the area. This thesis will not present an exact value for the social carrying capacity of the Colorado River, but rather, it will define and consider some of the parameters that would be necessary for such a computation.

The Development of River Trips

The greatest name in the history of the Grand Canyon and the Colorado River is that of Major John Wesley Powell. Little was known about the Colorado River in 1869 when Powell made his first trip to collect geological data. His success led others to the Colorado River, and before the turn of the century, men had braved the River for various reasons, i.e., trapping, prospecting, surveying for railroads, and scientific exploring.

Hoover Dam, completed in 1931, was the first control on the Colorado River, but has had little effect on river trips within the Grand Canyon. Although Lake Mead, a reservoir 115 miles long, flooded some of the river's rapids, it had negligible effect on the upper reaches of the River. However, when Glen Canyon Dam was completed in 1963, the historical period of the Colorado River as a "wild" river within the Grand Canyon was ended

(Hughes, 1967). The flow of the River within the Canyon became entirely dependent on the releases from Glen Canyon Dam.

No one is really certain when people began "running" the Colorado solely for recreational pleasure, but some believe that the Galloway and Richmond expedition of 1897 was the first; if only because they did not have a specific reason for the expedition. Norman Nevills was probably the first commercial outfitter on the River. He ran his first commercial trip in 1938, taking seven people with him. Ms. Georgie White made the first river trips that resemble current commercial expeditions. She used rubber rafts and took 28 people on her 1955 trip, the largest party on record at that time (Eiseman, 1972).

At the present time, commercial outfitters offer a variety of river trips; each providing a somewhat different experience. While the majority use motor powered neoprene rafts, some still offer the opportunity of "rowing" through the entire Canyon. Since the trip's length, price, size, and frequency vary, a user can select the type of trip or the type of experience he desires to maximize his satisfaction; given time, income, and opportunity constraints.

Popularity of River Trips

Hundreds of thousands of visitors yearly see the Grand Canyon from the rim, but few ever view it from the

Canyon floor, and even fewer traverse the Canyon's 250 mile length "shooting the rapids" of the Colorado River. Colorado River trips generally begin at Lee's Ferry, Arizona, and end at Lake Mead (Figure 1). The entire length of the Grand Canyon National Park and National Monument are traversed during the trip. People can elect shorter trips, joining or leaving at Phantom Ranch, on the Canyon floor below the South Rim Village in the National Park.

The number of people taking Colorado River trips has increased dramatically during the past few years, approximately 60% to 70% over each preceding year. Obviously, there are thousands more people who would make the trip were it not for time, money, or other constraints. The recreational season generally runs from late March to early October, with the highest use intensities in the summer months. The National Park Service limited the use of the Colorado River beginning with the 1971 season to help control and protect the resource. The limit was based on user-days,² and each outfitter was allocated a number of user-days based on his past volume of business. Essentially, the limit was set at approximately 10,000

2. A user-day is defined as an individual participating in a recreational activity during one day. Thus, a person taking a 10 day river trip will count as 10 user-days.

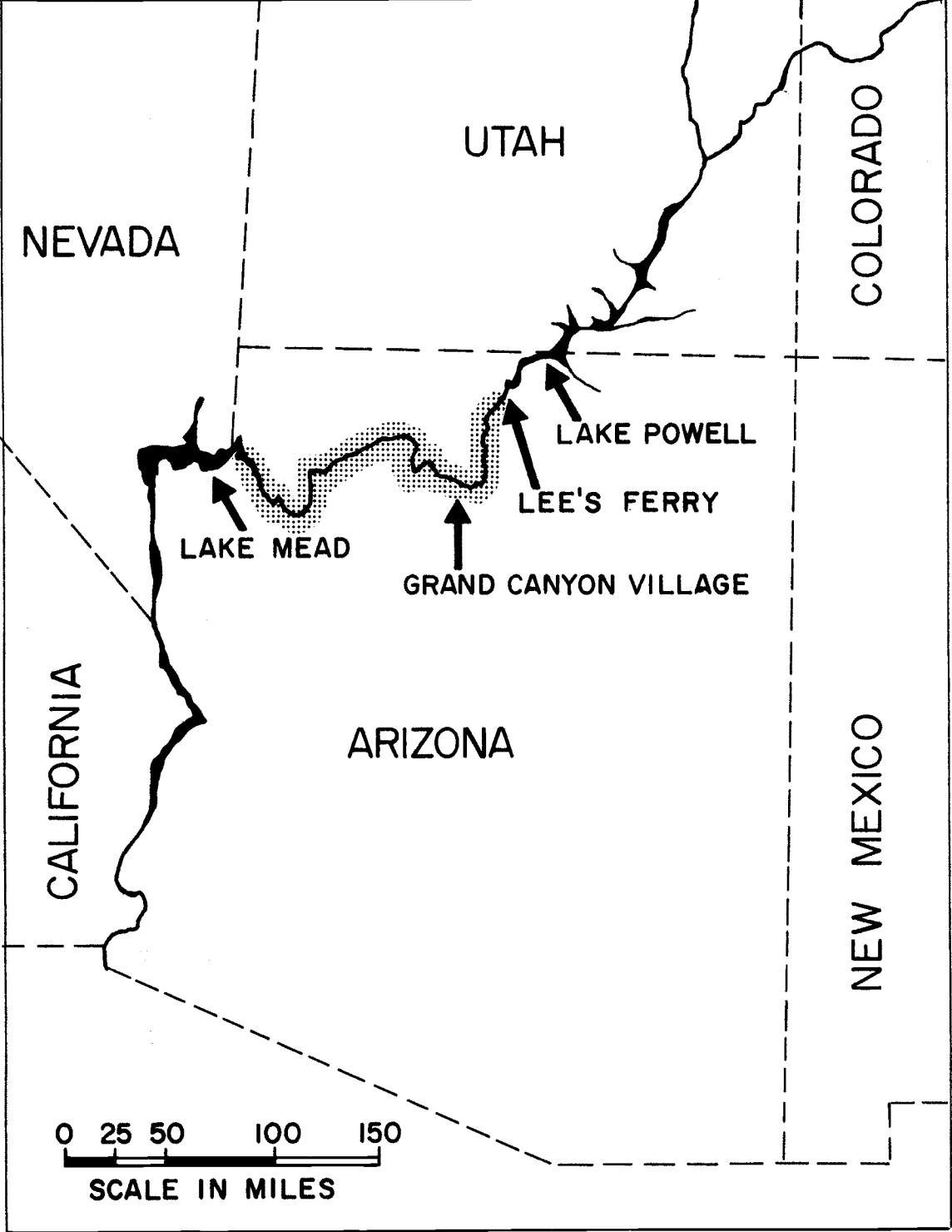


Figure 1. Grand Canyon Section of Colorado River Covered by River Trips

users for the 1971 season, the same number of users who participated in the 1970 trips (see Appendix C for details).

Objectives of Study

The primary objective of this study is to obtain information directly from users on the recreational use of the Colorado River for river trips, which can be used in the policy-making process. Specific objectives are to:

1. determine socio-economic characteristics of the people taking river trips;
2. develop an understanding of the user's expectations, perceptions, interactions, and satisfactions and dissatisfactions;
3. determine what policy-making decisions users think should be implemented.

Description of Thesis

Since data are of prime importance in any empirical research, Chapter II will be devoted to a description of the type of data needed, the method of collection, and the sources of data.

Chapter III is concerned with the individual question tabulation of the questionnaire, and the relevance of this physical tabulation to policy-making.

The underlying structure of the data is presented in Chapter IV, which is devoted to the results of

multivariate data-cluster analysis. The chapter provides additional insight of the results reported in Chapter III.

A brief summary of the results and of the policy implications is given in Chapter V.

CHAPTER II

METHOD OF STUDY

Before a method of study could be designed, it was necessary to determine the type of data and analysis that would be most useful to the decision-makers. Discussions with National Park Service personnel and representatives of the Colorado River Outfitters Association provided insight into the reasons for past management decisions and the type of decisions that each felt would be necessary in the near future.

The question of crowding was obviously the most urgent social consideration of both groups, requiring immediate attention. The Park Service was concerned about the increasing incidence of crowding reports on the River. They desired an evaluation of the present crowding situation, and some indication of the potential for future crowding. This would not only satisfy their immediate planning needs, but would also be useful in long-term planning. The outfitters would also benefit from projected user-intensities in their long-range planning process.

Determining the socio-economic backgrounds of the users was another area of investigation which the Park Service believed would be helpful to them. Since they are

the management agency responsible for the operation of the Colorado River within the National Park and Monument, they want to gain some knowledge and understanding of the people who are directly affected by their policy decisions. This type of information would aid them in establishing a better working rapport with their clientele, and thus, help to initiate the type of regulations and controls that are desired by the users.

Another area of investigation was to consider how people evaluated the trip as an overall experience. This would include such parameters as: trip management, intensity of group interaction, time considerations, and environmental interactions. Both management organizations would find this information useful in evaluating whether they actually are providing the type of experience the population wants.

The researchers decided to investigate the long-term effects of the experience by using past "river-runners" for their sample. One could approach this problem in several ways, however, it was decided that a mailed questionnaire to past participants would best fulfill the research objectives.

Questionnaire Development

A mail survey of past river users (1967 through 1970) was used to provide the necessary data. Careful

attention was given to the development of the questionnaire, assuring that it was short, easily understood, and answerable. Several published questionnaires were consulted along with the Outdoor Recreation Resources Review Commission's (ORRRC) Study Report 3 (1962).

Prior to any mailings, the questionnaire was reviewed by selected University of Arizona faculty, National Park Service personnel at the Grand Canyon, and representatives of the Colorado River Outfitters Association. After this review, the revised questionnaire was pre-tested on a sample of one hundred past river users to evaluate the mailing procedure, response rate, problems answering questions, and general comments made by the pretest sample. Sixty-eight per cent of the pretest sample completed and returned the questionnaire.

The questionnaire was modified based on responses from the pretest. Each person in the actual study sample received the four page questionnaire, a separate introductory letter, and a postage paid return addressed envelope. Questionnaires were numbered to assure anonymity.

Questionnaire Format

The final questionnaire was divided into three major organizational areas: (1) background material, (2) perception of policy considerations, and (3) the users' values (see Appendix A).

The section to obtain individual background material was as brief and general as possible. Because the questionnaires were numbered, there was no need to ask the users for their names. The month and year of a trip and the outfitter who ran the trip were coded on a duplicate address label, which was numbered correspondingly, eliminating the need to ask this information. Questions could be answered by marking an "X" in the appropriate box, or by filling in a blank space.

The policy section used the "Yes-No" format, and the values section the "True-False" format. The "True-False" section was further divided into a "Before" and "After" section, to determine the respondents' opinions both before and after their experience. This method was used to investigate how the trip changed the participants. Open-ended questions and space for general comments were also provided.

Selection of the Random Sample

The National Park Service provided trip rosters for 1967, 1968, 1969, and 1970 river users. A random number was selected between 1 and 5, and every succeeding fifth name with a usable address was selected. Trip rosters were originally composed by the individual outfitters and submitted to the Park Service with little quality control. Thus, there was some difficulty with the rosters not

containing complete mailing addresses for all users, and it became necessary to omit from the sample those names with insufficient mailing information. This method provided the largest possible sample given time and monetary constraints. As a result, 2,622 people received questionnaires (see Table 1).

Table 1. Yearly Distributions of People Receiving Questionnaires

Year	Number Receiving Questionnaires	Total Number That Year	Per Cent Representation
1967	339	2,099	16%
1968	410	3,608	11%
1969	616	6,019	10%
1970	1,257	9,935	13%

One hundred eighty-five questionnaires were not deliverable and were returned by the U. S. Postal Service. Twenty-two questionnaires were received too late for processing, while ten were returned unanswered, and seven could not be used for various reasons. Thus, the resulting sample used in analysis consisted of 1,578 questionnaires,

or a 65% response rate, indicating a strong interest and concern for river trips by the participants (Table 2).

Table 2. Questionnaire Response Rates by Year

Year	Number Responding	Percentage	Percentage of Total Number That Year
1967	133	39%	6%
1968	215	52%	6%
1969	376	61%	6%
1970	854	68%	9%

A second attempt to contact the 35% of those sampled who did not return their questionnaires was not made. Although this might bias the results of the study, it was judged that the additional cost necessary to collect these data was not justified.

Method of Analysis

The data analysis consisted of both individual question tabulation and multivariate data-cluster analysis. The physical tabulation of individual question responses is reported in the text as percentages of the total response for each question. The tabulation, and accompanying tables,

present the intensity of responses to the individual questions (Chapter III). Cluster analysis was used to determine if any underlying structure of the data existed (Chapter IV), and consisted of both variable and object analysis (Tryon and Bailey, 1970).

CHAPTER III

RESULTS OF STUDY

This chapter presents the results of the individual question tabulation. The presentation is divided into four sections: a description of the socio-economic backgrounds of the users, a description of the trip as an experience, a presentation of user perceptions of the individual trip management, and a consideration of the question of "crowding." The results of cluster analysis are presented in Chapter IV.

Socio-Economic Characteristics

Decision-makers desire to know and understand their clientele's tastes, preferences, wants, and sociological backgrounds. Because these data are lacking for river trip participants, an attempt was made to gain some understanding of user socio-economic makeup.

The data clearly show that river trip participants are in the higher income brackets. Nearly half of the sample responded that their total family income exceeded \$20,000 annually, and almost two-thirds had incomes in excess of \$15,000 yearly. A survey conducted by the Outdoor Recreation Resources Review Commission (ORRRC)

of seven outdoor recreation sites throughout the United States showed considerably lower income distributions (see Appendix D).

There are very few physical restrictions on people who want to participate in river trips, and therefore, all age groups are represented (see Appendix B). The mean age of the sample is 40 years, which agrees with the ORRRC study. Most of the people are still working: two-thirds are employed or self-employed; 12% are housewives, and 16% of the sample are students.

Nearly two-thirds of the sample population is male. There appear to be three distinct groupings of people who make the trip: (1) husband and wife, (2) father and son(s), and (3) male and male friend. Although this study did not determine the actual sizes of these groups, the decision-makers should be aware that they exist.

The type of outdoor activities in which people participate regularly should give some indication of whether they would be interested in participating in river trips. One would expect that "river-runners" have previous experience in camping, hiking, and other related outdoor activities. Those sampled were asked to indicate the outdoor activities in which they commonly participate and to indicate the activities in which they engage during their vacations (Table 3).

Table 3. Outdoor and Vacation Activities in which "River-Runners" Commonly Engage

Activity	Outdoor	Vacation
Hunting	15%	8%
Fishing	32%	22%
Back-packing	30%	20%
Horseback riding	16%	8%
Boating	37%	24%
Golf	20%	10%
Tennis	26%	10%
Swimming	61%	41%
Mountain climbing	7%	4%
Bicycling	32%	7%
Camping	59%	47%
Water skiing	20%	10%
Snow skiing	33%	22%
Hiking	55%	41%
Photography and sketching	19%	15%
General sightseeing	73%	66%

Over half of the participants in river trips camp and hike on a regular basis. They generally participate in the other outdoor activities, suggesting that "river-runners" are "outdoorsmen."

The Trip as an Experience

This section will discuss how the users perceived the trip as an experience, considering how they thought of the trip and how the trip affected them.

The Trip's Importance to the Users

This study was directed at past users of the Colorado River in order to investigate the impact of "running" the River on the people. Policy-makers should be aware of the intensity of feelings toward the experience before decisions are made that could upset the users or change the value of the experience.

According to Clawson and Knetsch (1966), there are five aspects of the recreation experience: anticipation, travel to the actual site, on-site experiences and activities, travel back, and recollection. Anticipation is an important part of the total recreation experience. Seventy per cent of the respondents anticipated their trips less than one year, with the largest percentage in the 2 to 6 month category. This suggests that the trip planning period may be relatively short and that the participants

are rather mobile and free to go on vacations with short planning, possibly substituting money for time.

Associated with anticipation, and especially with intensity of use, is the effect of advertising. Determining the sources of information about the trip is important when considering policy-making decisions that might limit the use of the resource. If decision-makers know the sources of information about river trips, then they will know what media to use to convey information to prospective users.

Past users were asked to indicate the sources of information about their river trips (Table 4). Published brochures from trip operators and/or organizations were the most effective means of obtaining information. Some people have written news articles for their local newspapers and for some magazines after their river experience. In addition, whenever a "famous" person, i.e., a politician, movie star, adventurer, etc., made the trip, there was a barrage of news releases that followed. This gave publicity to the person, and also advertised the trip effectively. Discussions with friends or relatives who have made the trip was another effective means of obtaining information. Although the other sources of information were effective, these three seem to be the most effective and the ones that should be considered by the decision-makers when disseminating information.

Table 4. Sources of Information About River Trips

Source	Percentage ^a
Friends or relatives who had made the trip	46%
Brochures from trip operators, organizations, etc.	68%
Newspapers, magazine articles, or books	55%
Movies	22%
Travel agent	2%
Others	21%

^aPercentages do not sum to 100% because respondents could give multiple responses.

Another experience-intensifying aspect of the trip is the opportunity to make new friends. People are generally in close contact during the entire excursion and thus experience considerable group interaction. The boatman, or group leader, encourages such interaction by sponsoring and initiating activities that will "get people together." Although this study chose not to investigate these specific group interactions, it was able to consider the strength of individual relationships, i.e., whether friendships made on the trip were lasting or superficially short relationships.

Individual perceptions of the friendships made on the trips are given in Table 5. Although these data fail

Table 5. Intensity of Friendships Made on River Trips

Of the new people that you met on your trip, have you:	Percentage ^a
corresponded with any once or twice?	52%
developed a regular correspondence with any?	12%
gotten together with any since your trip?	45%
plan to get together in the future?	18%

^aPercentages do not sum to 100% because respondents could give multiple responses.

to give any indication of "how many" new friends were made on the trip, they do suggest that many of the participants formed relationships strong enough to warrant at least one additional meeting. When asked directly, "Did you develop any lasting friendships on your trip?" 44% answered "yes," albeit 52% responded negatively.

Appreciation of the Trip

The respondents were asked to evaluate the weather during their trips and their enjoyment of the trip. There was little surprise in the results showing that the participants overwhelmingly enjoyed the trip, as 67% responded "super" and 27% considered the trip "very good." However, it was expected that there would be some correlation

between their perceptions of the weather and the trip enjoyment. It was presumed that a trip experiencing inclement weather would cause some deterioration of the user's enjoyment. Table 6 illustrates the relationships between weather and trip enjoyment; data show that there is an apparent relationship between the two perceptions, at least after a time to reflect on the experience.

Table 6. Trip Enjoyment vs. Perception of Weather

Weather	Trip Enjoyment				
	Super	Very Good	Good	Poor	Dismal
Super	49.52%	35.38%	12.99%	1.42%	0.66%
Very Good	20.04%	57.31%	19.81%	2.83%	--
Good	13.58%	28.39%	44.44%	9.87%	3.70%
Poor	20.00%	60.00%	--	--	20.00%
Dismal	--	--	--	--	--

One often hears about environmental degradation and man's adverse impact upon the environment, but less frequently does one hear of the environment's impact on man. One can study both aspects by investigating Colorado River trips, e.g., look at a "river-runner's" respect for Nature and how he has changed because of his river experience.

The vast majority (72%) replied that the experience had reinforced or changed their conservation values. An even larger percentage (92%) felt that they were encouraged to leave their campsites in "better condition" than found. This suggests that the trip is an environmental learning experience, and that there is a conscious effort to maintain the area. Further, 98% of the sample believes that the Colorado River within the Grand Canyon should remain a wilderness area, and 91% do not want more developments like Phantom Ranch built along the River. Only one-third want improved campsites along the River, with nearly all of the one-third specifically mentioning improved toilet facilities. A small number of those not wanting improved campsites also felt that the toilet facilities should be improved.

The Trip Experience

Knowing the users' perceptions of the trip as an experience will aid in initiating policies that are consistent with the desires of the users. Policy-makers will be more effective in their efforts if they know and understand why people make river trips, what they expect to gain from them, and if they learned and grew from the experience.

Those sampled were asked to respond to twenty questions about Colorado River trips, indicating their beliefs "Before" and "After" their experience. It was hoped that

there would be some difference between their perceptions, indicating a change between what they anticipated and the actual experience (Table 7).

One-fifth of the sample thought that their river trip would provide the opportunity to get away from people, but found this not so. Nearly the same number (19%) found that their pre-trip perception of getting away from pollution was also wrong. However, 13% of the sample had originally felt that the trip would not provide the opportunity to learn about other people, but changed their opinion after the experience. Generally, the changes reported in Table 7 seem to be small, but they should be studied by the decision-makers to gain some knowledge of what the users thought they would experience, and their actual experiences.

Ninety-five per cent felt that a river trip is a unique experience, and nearly that many (91%) perceived the experience as being full of excitement and adventure. One might expect this strong response because of the user's enjoyment of the trip, which further emphasizes the basic satisfaction of the experience. "Running" the Colorado River can be dangerous, so those sampled were asked to indicate whether they felt that the trip had moments of danger. Eighty per cent answered affirmative, indicating their belief that river trips involve some danger. However, this figure is 2% lower than the "Before" response,

Table 7. Changes in "Before" and "After" Responses of the "True-False" Questions

Question	No. T-F ^a	% T-F	No. F-T	% F-T
(s) allows one to get away from people	311	19.70	32	2.02
(e) allows one to get away from pollution	300	19.01	38	2.40
(c) has moments of danger	182	11.53	141	8.93
(j) allows one to test his physical abilities	143	9.06	147	9.31
(i) allows one to learn about other people	19	1.20	207	13.11
(d) is something my friends would like to do	60	3.80	123	7.79
(t) allows one to get away from the technology of civilization	148	9.37	35	2.21
(f) allows one to learn about himself	21	1.33	150	9.50
(p) increases one's understanding of the man-environment relationship	23	1.45	131	8.30
(g) allows one to gain communion with God	11	0.69	101	6.40
(k) allows one to enjoy the companionship of camp life	43	2.72	69	4.37
(n) allows one to express artistic talent through photography, sketching, etc.	27	1.71	84	5.32
(r) allows one to "get away from it all"	79	5.00	32	2.02

Table 7.--Continued

Question	No. T-F	% T-F	No. F-T	% F-T
(a) is a wilderness experience	53	3.35	44	2.78
(q) is full of excitement and adventure	65	4.11	31	1.96
(m) allows one to learn about Nature	37	2.34	39	2.47
(b) allows communion with Nature	24	1.52	42	2.66
(o) allows one to get away from the impersonal urban environment	25	1.58	31	1.96
(l) is a unique experience	15	0.95	28	1.77
(h) allows one to observe the beauty of Nature	3	0.19	9	0.57

^aThis table is ordered so that questions with the largest number of changes (the sum of the number of changes of both T-F and F-t) appear first. Percentages are based on the total sample (1578) responses).

indicating a small segment who felt that the trip would be more dangerous than the actual experience. The people were aware of the potential dangers, and generally found that their anticipations were correct.

Because river trips are still only enjoyed by a small segment of the population, the question of "status" is relevant. There is no direct effective measure of "status," so the participants were asked if "a trip down the Colorado River is something your friends would like to do." Seventy-seven per cent replied that they did believe that their friends would like to make the trip.

Klausner (1971) has defined three basic relationships involving man: (1) man-self, (2) man-man, and (3) man-environment. All three are important in describing how man learns and relates. The man-self relationship describes man's individual learning experiences, how he gets to know himself and how this affects him. The man-man relationship considers one's relationship with other individuals, while the man-environment type considers how one's environment interacts with man to change him. All three are essential in understanding the sociological makeup of the users.

Nearly two-thirds (65%) of the sample indicated that they learned about themselves on their trip. The data reflect different types of learning experiences, i.e., they were able to investigate different aspects of their

personalities. On a spiritual basis, 56% responded that the trip allowed them to gain communion with God, suggesting that the majority of the participants gained some spiritual benefits and/or satisfaction from the experience. Because good health and physical fitness are important to most Americans, the question was asked if the river trip allowed them to test their physical abilities. Many (62%) replied that it did. Because the mean age of the sample was about 40 years, this opportunity may come for many at a time when they are starting to feel "over the hill," and are interested in determining if they are still the "man they used to be."

Expressing one's artistic talent is important to individuals, because this is a form of communication. Ono (1970) describes two types of people in the world: those who can communicate through art, and those who can, but do not. Most (82%) responded that they were able to express their artistic talents through photography, sketching, etc. Decision-makers must act to preserve this opportunity for the users.

Learning about and understanding other people is an important aspect of any civilization. When one gains some feeling for the other people who make up his society, it helps to assure the perpetuation of the society. A society can not function without individuals working and growing together. Eighty-three per cent replied that the

trip did permit them to learn about other people. However, of this number, there were 207 people who did not believe that the trip would teach them anything about other people, but who changed their opinion after the excursion. Virtually all those in the sample (91%) answered that the trip allowed them to enjoy the companionship of camp life.

In recent years, the importance of the man-environment relationship has received increased attention by the general public. Society is increasingly aware of the fragile balance between man and his environment, and is taking action to help protect and preserve his environment. Therefore, it is important when 85% of the past River users reply that their trip increased their understanding of the man-environment relationship, and 92% felt that it was a wilderness experience. The data show that a close relationship developed between the users and the environment as 93% indicated that the trip allowed them to gain communion with Nature, and an equal number felt that they learned about Nature. Perhaps this relationship accounts for the overwhelming response (97%) by those sampled that the river trip enabled them to enjoy the beauty of Nature. These data clearly show that participants developed a stronger feeling and respect for their environment.

The sample was asked to indicate the three questions that contributed "most" and the three that

contributed "least" to the trip experience. The results are shown in Table 8.

The opportunity to observe the beauty of Nature was most frequently noted as contributing "most" to the trip experience. This was closely followed by three questions indicating that a river trip is a unique experience, a wilderness experience, and full of excitement and adventure. On the other hand, getting away from people was the "least" important aspect of the trip experience, suggesting the participants probably expected to enjoy the experience with others. Other aspects of the trip that contributed "least" to the experience include: testing one's physical abilities, learning about other people, gaining communion with God, doing something one's friends would like to do, and expressing artistic talent.

Individual Trip Management

This section discusses those questions that were related to the individual trip management, and should be of more equal interest to the Colorado River Outfitters Association and the National Park Service, because it deals directly with the events that are common to the operation of all river trips.

Those sample concurred (91%) that the trip outfitters provided sufficient pre-trip information. This includes such items as what to bring, what type of clothing

Table 8. Ranking of the "True-False" Questions According to Those That Contributed "Most" and "Least" to the Trip Experience

Questions	Contributed "Most "	Contributed "Least "
(h) allows one to observe the beauty of Nature	50%	< 1%
(l) is a unique experience	38%	2%
(a) is a wilderness experience	37%	2%
(q) is full of excitement and adventure	33%	2%
(r) allows one to "get away from it all"	19%	7%
(p) increases one's understanding of the man-environment relationship	13%	8%
(c) has moments of danger	12%	7%
(b) allows communion with Nature	11%	2%
(k) allows one to enjoy the companionship of camp life	10%	9%
(m) allows one to learn about Nature	10%	1%
(o) allows one to get away from the impersonal urban environment	6%	12%
(f) allows one to learn about himself	6%	14%
(t) allows one to get away from the technology of civilization	9%	15%
(e) allows one to get away from pollution	2%	16%

Table 8.--Continued

Question	Contributed "Most "	Contributed "Least "
(n) allows one to express artistic talent through photography, sketching, etc.	6%	12%
(d) is something my friends would like to do	< 1%	22%
(g) allows one to gain communion with God	5%	22%
(i) allows one to learn about other people	5%	22%
(j) allows one to test his physical abilities	4%	23%
(s) allows one to get away from people	2%	31%

is necessary, when and where the trip will start and end, and similar logistical considerations. However, the sample was split when asked if they wished that they had read more educational material on the Grand Canyon and the Colorado River. Forty-nine per cent responded "Yes," and the same number negatively. Eighty-six per cent indicated that their boatman made the trip more enjoyable by pointing out natural phenomena, emphasizing a strong desire by many to use the trip as an educational experience.

Virtually all (94%) said that they found what they were looking for on the trip, while 87% replied that the river trip was the major activity on their vacation. Most used the entire vacation for the river trip, so one may conclude that the users thought it would satisfy their vacation desires.

River trips are scheduled as to their departure time and their termination time. Thus, the group must make a minimal amount of progress daily in order to finish on schedule. Because of the possibility of "rushed" trips, the sample was asked if they had enough time for exploring and relaxation. Again the sample was split, as 50% felt that they did have enough time for exploring, while the other half disagreed. When they considered the question of enough time for relaxation, almost all (91%) said that they did have enough time for relaxation.

Crowding?

The national recreation areas of the United States are experiencing increased crowding of available facilities, and according to some observers, the Colorado River from Lee's Ferry to Lake Mead is no exception. Of critical importance is the user's perception of a crowding problem and the relationship of this perception to regulatory actions. Since user limits have been set for the River by the Park Service, this study attempted to determine if they were justifiable, adequate, and equitable from the viewpoint of past users. Ecological parameters were not considered.

One can distinguish and measure two distinct types of crowding conditions, or potential crowding conditions, associated with river trips: (1) the size of each individual group or trip, and (2) the interaction of different groups along the River at any one time. The size of an individual trip remains constant for the duration of the excursion. On the other hand, the second condition may only exist sporadically throughout the day, when one group overtakes another group. Two or more groups often stop at the same scenic or historic place for hiking, and on occasion, more than one group will share a camping site at night.¹

1. This situation is avoided whenever possible by all the outfitters operating on the River.

Individuals were asked to indicate approximately how many people were on the river trip they took, and to evaluate this as: too few, too many, or about right. Table 9 reports the results of these questions. Virtually none responded "too few" regardless of the size of their trip. The percentage of those answering "too many" seems to increase as the size of the trip increases, whereas those answering "about right" decreases as the size of the trip increases. When considering these data together, one sees that the percentages answering "about right" are greater than those for answers of "too many" until trip sizes of 41 to 50 people. This indicates that in general, for trip sizes less than 40 people, the majority of users are satisfied with the trip size, but when trips get larger than 40 people, the majority felt the size was too large.

The second type of crowding that can occur on the River is also important to river managers, outfitters, and users, as it concerns the total number of groups on the River at a given time, and their spatial distribution. Respondents were asked several questions to determine if they had seen other parties, what the effect of seeing other parties was, and what their opinions were about future management policies. More than 90% of the sample responded that they had seen other parties on the River, and their reactions are shown in Table 10. Notably, more

Table 9. Individual Reactions to Different Size River Trips

Size	% of Sample on Trip	Too Few	About Right	Too Many
1-5	0.31%	40%	60%	--
6-10	3.86%	3%	93%	3%
11-20	21.03%	--	83%	16%
21-30	35.74%	--	79%	21%
31-40	21.79%	--	62%	38%
41-50	7.98%	1%	40%	57%
over 50	9.06%	1%	36%	62%

Table 10. Reactions to Seeing Other Groups on the River

	Total	1967	1968	1969	1970
Very annoying	3%	3%	3%	2%	3%
Annoying	9%	11%	8%	7%	10%
Tolerable	25%	21%	21%	28%	26%
Not annoying	36%	34%	43%	36%	34%
Reassuring	4%	4%	3%	2%	4%
Enjoyable	22%	25%	19%	23%	22%

people thought that the other groups were "reassuring" rather than "very annoying." The largest number (35.85%) thought that the other trips were "not annoying" while nearly equal numbers thought that they were "tolerable" and "enjoyable." The significance of the large number who felt that the other trips were "enjoyable" and "not annoying" should not be overlooked by the decision-makers. Only about 12% of the sample were annoyed or very annoyed at seeing other trips on the River. All other users were not overly upset by the other groups, and in fact the majority found them at least tolerable.

One might expect some variation in response to the spatial distribution of trips when tabulated by years. The year 1967 had the fewest participants, and 1970 the most participants, so it would be useful in policy decisions to note any variations in the users' perceptions for the various years, and thus, in the different user-intensities.

There was a difference in the number of people who saw other groups when the yearly tabulations were compared to the aggregate results. In 1967, 75% of the sample saw other groups, compared to 85%, 89%, and 96% for 1968, 1969, and 1970, respectively, reflecting the increased user intensities per year. Thus, in 1970, it was virtually impossible to make the journey without encountering another party, whereas in 1967, three out of every four trips saw other groups. However, when the reactions to seeing other

groups on the River are compared to both the aggregate response and to other years, there does not appear to be a difference (Table 10). Regardless of the user-intensity, and thus the incidence of encountering other groups, the participants' reactions to the other groups is consistent. However, the population of river trippers may have changed over time such that present populations have a greater tolerance of crowding than previous populations.

Management agencies should know their clientele's perceptions of policy needs prior to making new policy. Thus, it was felt that the participants should be questioned about future regulatory practices.² They were asked "should the number of people taking river trips through the Grand Canyon be limited?" More than three-fourths (77%) believed that the number should be limited, but of that number, 70% would have been disappointed in having to postpone their trips because of user limits. Although this supports limiting policy on the River, people almost un-animously agreed (90%) that people have the right to take more than one river trip in their life-time, and over half

2. Because the sample represents only 1967 through 1970 users, this offered the opportunity to question people who made river trips before the user limits were instituted by the Park Service. These people were not affected by the policy regulations, so it was possible to determine their perceptions of the need for such policy.

(55%) said that people should be encouraged to take river trips.

Two-thirds of those who participated in the study said that they expected to make other Colorado River trips, and of this number, half will take longer trips. Time appears more constraining than money, because 77% said that they would make more river trips if they had more time, whereas 57% said that they would take more trips if they had more money. This is to be expected, because of the high total family incomes reported. Hence, the number of "repeaters" taking river trips may be expected to increase in future years.

CHAPTER IV

CLUSTER ANALYSIS RESULTS

Understanding our world requires conceptualizing the similarities and differences between the entities that compose it (Tryon and Bailey, 1970, p. 1).

This chapter discusses the results of the multi-variate data-cluster analysis. The first part of the chapter will briefly describe cluster analysis as used under the BC TRY computer system. A glossary of the pertinent terms is provided. Additional information can be obtained in Tryon and Bailey (1970).

What is Cluster Analysis?

Understanding the entities that compose man's world has always been the goal of science, and cluster analysis is a general logic procedure that groups entities on the basis of their similarities and their differences. A set of variables can logically be grouped according to one's own rational composition; however, this logical grouping procedure takes no account of the correlations among the variables. Cluster analysis in multivariate data affords the opportunity of studying the underlying structure of the data.

Data amenable to cluster analysis are those of multivariate experiments in which a number of different objects (subjects, respondents, etc.) are each assessed (observed, measured, counted, etc.) on a number of different variables (Bailey, 1971). The data from this study are therefore applicable to cluster analysis.

There are four goals or sub-objectives in cluster analysis of variables: (1) condensation of the variables into basic dimensions that capture a significant amount of the general covariation among the variables, (2) selection of homogeneous subsets of variables that are observable representations of the basic dimensions, (3) description of the statistical properties of the dimensions and clusters, and (4) geometrical (graphical) description of the cluster structure of the data (Bailey, 1971). The goals of cluster analysis on the objects are to: (1) compute the position of each of the objects within the dimensions described in variable analysis, (2) find the points of concentration within the dimensions, and (3) graphically represent the computed profiles.

Variable Analysis

The variable analysis, or V-analysis, is the first step of cluster analysis. V-analysis poses questions like: when one observes 24 different intellectual abilities of many children, is it necessary to preserve all 24, or can

a reduced number of composites of them fully account for all that is general among the 2^4 abilities? (Tryon and Bailey, 1970). The goal of V-analysis is to reduce the n variables to a smaller number of collinear clusters. There are three main selection criteria for each cluster: (1) each should be as collinear ("tight") as possible, (2) each should be as nearly independent (orthogonal) of the others as possible, and (3) each should be able to account for as much general variability as possible. When the clusters are defined, one can name each cluster according to its characteristics. These names are assigned by the researcher, not the algorithm.

Object Analysis

After the V-analysis has defined the collinear clusters for the data, the next procedure is object analysis, or O-analysis. The process involves representing each respondent as a point in each defined cluster, which is the respondent's factor score. The degree of similarity of any two respondents is the distance between their two points, an index called the Euclidean distance D . The process of grouping is implemented by searching in the score space and discovering those concentrations of points which define distinctive types of respondents. The resulting factor means can be graphed illustrating the different respondent-grouped profiles.

Applicability to Colorado
River Trips' Data

The original intent of this study was to include all of the relevant variables in one computer run. However, this did not prove feasible for two general reasons: (1) the clusters defined were not judged "good," and (2) the financial cost increases geometrically with the number of variables. The problem was that the clusters failed to account for enough of the total variability, were not "tight," and many of them consisted of only two variables. Therefore, it was decided to use smaller subsets of the data. The "Yes-No" questions, "True-False" questions, and outdoor activity data were each run as an independent group. Other variables, e.g., income, age, etc., were included with the sub-groupings, but none of these variables appeared in final clusters.

The remainder of this chapter presents and discusses the results of the three sub-groupings of data, as they seem to provide the most information and they best satisfy the criteria for cluster analysis.

Cluster Analysis on Outdoor Activities

Cluster analysis was used to determine whether a relationship exists between the type of outdoor activities in which "river-runners" participate and their income level. V-analysis defined three clusters, but none of the income categories entered into the resulting clusters. This

indicates that there is no tendency for any group of river trip participants in the same income category to participate in certain outdoor activities.

The three clusters defined by the algorithm can be described as follows: (1) wilderness activities, (2) individual activities expending relatively little energy, and (3) individual activities expending high energy values (see Table 11). These three clusters explain 94% of the total generality and 91% of the total variability. The reliabilities (repeatability of the clusters) for the three clusters are 64%, 54%, and 46%, respectively--somewhat lower than desired, suggesting only a moderate chance of reproducing the same clusters if another sample is drawn.

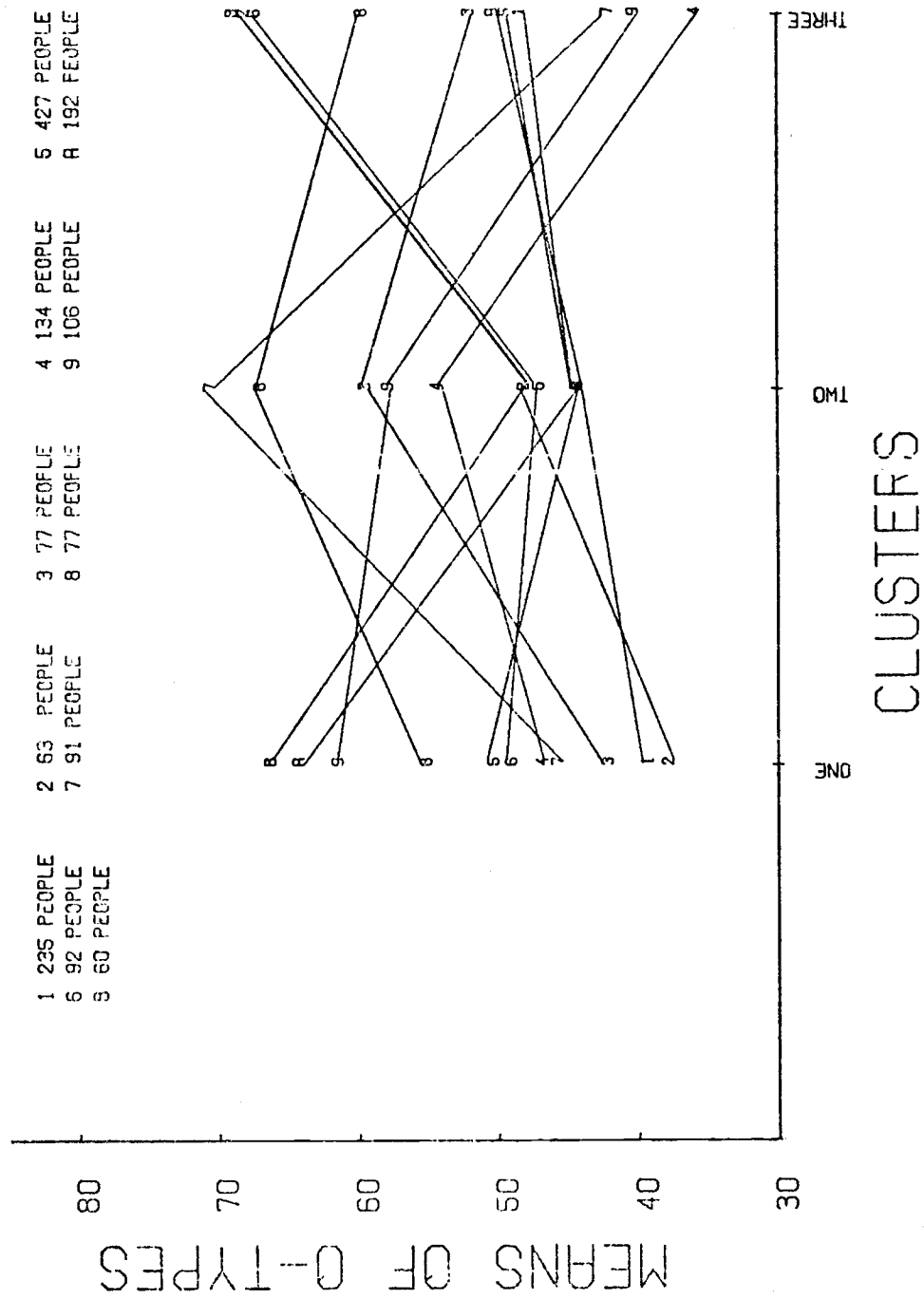
These clusters are dimensions on which one can measure the individual respondents, which is the next step--developing profiles for groups of respondents using O-analysis.

Factor scores were calculated for each individual. Using the concentration points in the score space, O-analysis was able to distinguish eleven different O-types, describing all but 24 of the total sample (less than 1%). The groups are relatively "tight" with homogeneities all between 79% and 92%. Figure 2 is a graphical representation of the factor means of the eleven profiles and also, the number of participants in each O-type. In order to become a useful input, each of the groups should be

Table 11. Clusters Defined on Outdoor Activities

Cluster	Definer
1. Wilderness Activities	Back-packing Hiking Camping Mountain climbing with equipment
2. Individual Activities Expending Relatively Little Energy	Fishing Hunting Golf Boating
3. Individual Activities Expending High Energy Values	Tennis Snow skiing Water skiing Not fishing

studied, characterized, and stereotyped. For example, the largest group is represented by 0-type 5. These are the people who ranked about average on the wilderness and strenuous activities clusters, but low relative to others on the less strenuous individual activities of cluster 2. In contrast, the smallest 0-type is number 11, people who ranked very high on clusters 1 and 3, and at about the same place as 0-type 5 on the less strenuous activities, cluster 2. The difference in intensities shown in Figure 2 is interesting. 0-type 11 might be stereotyped as the "thrill seekers." They are interested in the thrill of the strenuous individual sports and also mountain climbing,



1 235 PEOPLE
 2 63 PEOPLE
 3 77 PEOPLE
 4 134 PEOPLE
 5 427 PEOPLE
 6 92 PEOPLE
 7 91 PEOPLE
 8 77 PEOPLE
 9 106 PEOPLE
 A 192 PEOPLE
 B 60 PEOPLE

Figure 2. O-type Profiles on Outdoor Activities

hiking, back-packing, and camping; whereas, they are not interested in the more popular outdoor activities found in cluster 2.

Similar stereotypes can be assigned to each of the groups, giving the decision-makers a means of describing the people on the trip. For example, the second largest O-type is number 1, whose members can be described as having relatively little experience in the wilderness, and are generally non-participants in other outdoor activities. On the other hand, the second smallest group is O-type 2, whose members also have had little wilderness experience, but are very active in outdoor activities, especially in the strenuous ones.

O-types 9 and 10 are fairly large, and represent the other extreme--people with considerable wilderness experience. However, they differ in the type of outdoor activities in which they engage. Members of O-type 9 participate in the less strenuous outdoor activities rather than the strenuous ones, while the group represented by O-type 10 prefers the strenuous activities.

O-type 8 only represents 77 people, but they are the "super active" ones. They have had moderate wilderness experience and appear to engage in both types of outdoor activities regularly. The 91 members of O-type 7 are an interesting group. They have had some wilderness

experience, do not generally engage in strenuous activities, but are the most active in the non-strenuous ones.

Cluster Analysis on "Yes-No" Questions

V-analysis on these data defined three distinct clusters that explain 78% of the total generality and 71% of the total variability for the data. The cluster reliabilities are lower than the desired 100%; 60%, 45%, and 42%, respectively, however they still provide valuable information. The clusters can be described as: (1) more trips, (2) management appreciation, and (3) wilderness regulation (see Table 12).

Once again, a factor score for each participant was calculated on each cluster, and the resulting factor means are shown in Figure 3. Ten O-types were distinguished in the O-analysis, classifying all but 69 of those sampled (less than 1%). The overall homogeneities of the O-types are generally high (81% to 95%), suggesting "tight" groupings.

There appear to be only two response areas for cluster 2: those who did not appreciate the trip management, and those who did; while clusters 1 and 3 seem to attract strong, medium, and low responses. For example, O-types 2, 6, and 10 can be characterized as really appreciating the trip management, wanting to see regulatory policies initiated, and vary from desiring no additional

Table 12. Clusters Defined on the "Yes-No" Questions

Cluster	Definer
1. More Trips	A river trip is something I would do more often if I had more time.
	I would go on more river trips if I had more money.
	Do you expect to take more Colorado River trips through the Grand Canyon?
	Do you plan to run other wilderness and/or white water rivers?
2. Management Appreciation	Did the boatmen make your trip more enjoyable by pointing out natural phenomena?
	Were you encouraged to leave your campsites in better condition than when you had found them?
	Did you find what you were looking for on the trip?
	Did you feel that you had enough time for exploring on your trip?
3. Wilderness Regulations	Should people be encouraged to take river trips within the Grand Canyon?
	Do you consider an outboard motor a necessary part of a safe, pleasurable trip?
	Should more developments like the Phantom Ranch be built along the Colorado River?
	Not: Do you believe that the Colorado River should be maintained as a wilderness river within the Grand Canyon?
	Not: Should the number of people taking river trips through the Grand Canyon be limited?

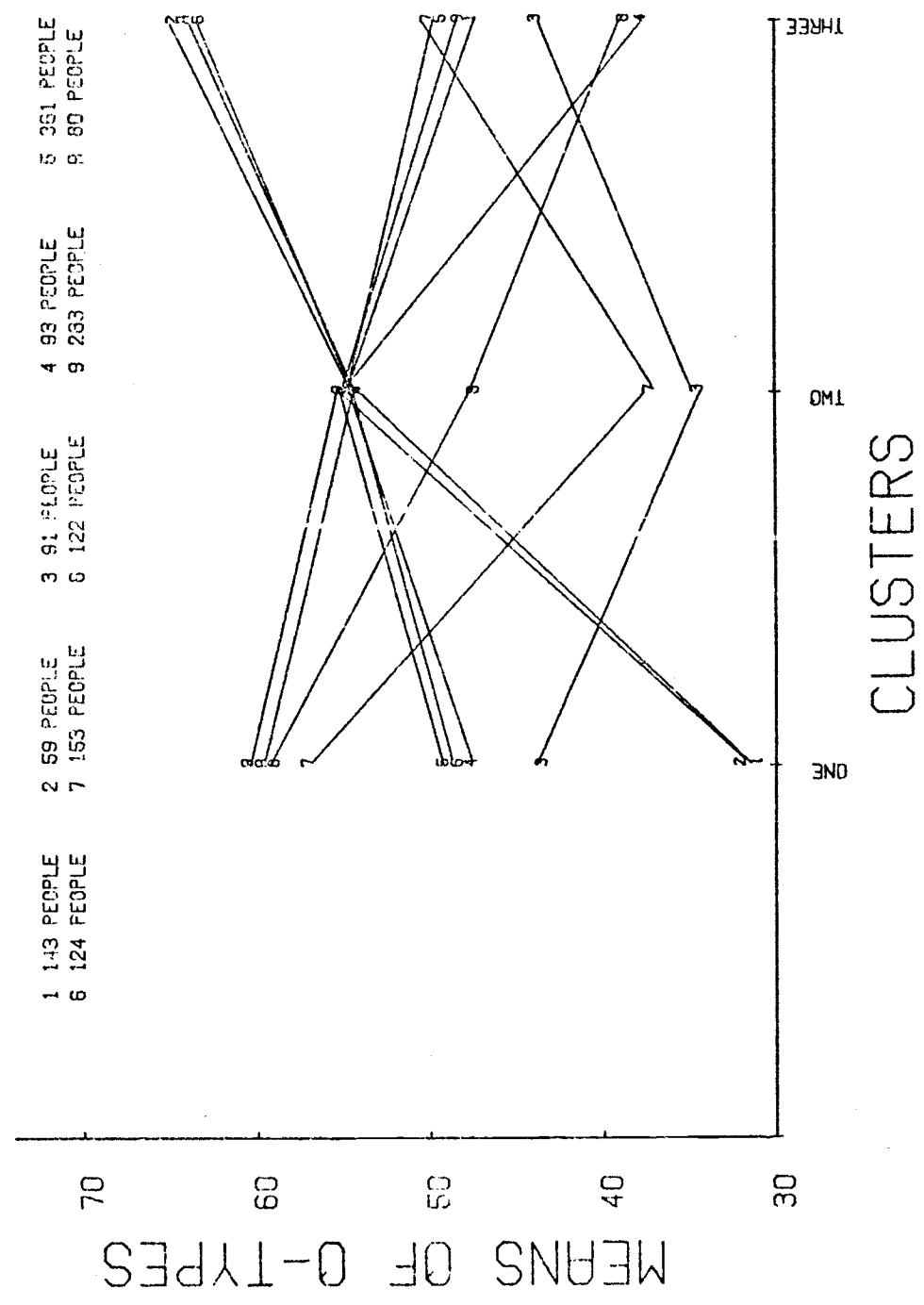


Figure 3. O-type Profiles on "Yes-No" Questions

river trips to planning to make more Colorado River trips. These groups all contain nearly the same number of participants. Those wanting to make additional river trips and also wanting regulatory policies appear somewhat hypocritical.

The largest group, O-type 5, are those who are moderate about taking more trips and desiring more regulations, but really enjoyed the trip. O-types 7 and 3 did not enjoy the management, were moderate about wilderness regulations, but O-type 7 was slightly more interested in taking more river trips. These are the people who perhaps wanted a type of experience that they did not completely receive.

Cluster Analysis on "True-False" Questions

Cluster analysis was originally used on both the "before" and "after" responses to the "True-False" data. However, because of the nature of the data, i.e., generally identical answers in both categories, the results were unsatisfactory. Therefore, the final computer run included only the "after" responses.

V-analysis distinguished four distinct clusters that were able to account for 98% of the total generality and 95% of the total variability. The clusters can be described as: (1) learning, (2) trip experience, (3) "get

away," and (4) wilderness adventure (see Table 13). The reliabilities for the first three clusters are reasonable (69%, 59%, and 60%, respectively), but the fourth cluster's reliability is low, 28%. The cluster was retained, however, for O-analysis.

The O-analysis found seven O-types using the "True-False" data (see Figure 4). The overall homogeneity of O-types ranges from 75% to 97%, and only 99 participants (less than 1%) are not represented in the O-types.

O-types 1, 6, and 7 represent the three largest groups of people, and are very similar in their characteristics. All three rate high on the trip experience, thought that it provided the opportunity to "get away," and perceived the trip as a wilderness adventure. Those members of O-type 1 felt that the trip was less of a learning experience than those in the other two O-types. Generally, these are the people who probably enjoyed their entire river trip. In contrast to these three O-types, the smallest group is represented by O-type 2. These are the people who tended not to appreciate the trip; they did not believe the trip was a learning experience; they ranked considerably lower than any of the other O-types on the trip experience cluster, and they did not feel that the trip allowed them to "get away" or that it was a wilderness adventure. These people are probably the chronic

Table 13. Clusters Defined on the "True-False" Questions

Cluster	Definer
1. Learning	allows one to learn about himself allows one to gain communion with God allows one to learn about other people allows one to test his physical abilities
2. Trip Experience	is a unique experience allows one to observe the beauty of Nature allows one to enjoy the companionship of camp life allows one to get away from the impersonal urban environment
3. "Get away"	allows one to get away from the tech- nology of civilization allows one to "get away from it all" allows one to get away from pollution allows one to get away from people
4. Wilderness Adventure	is full of excitement and adventure is a wilderness experience

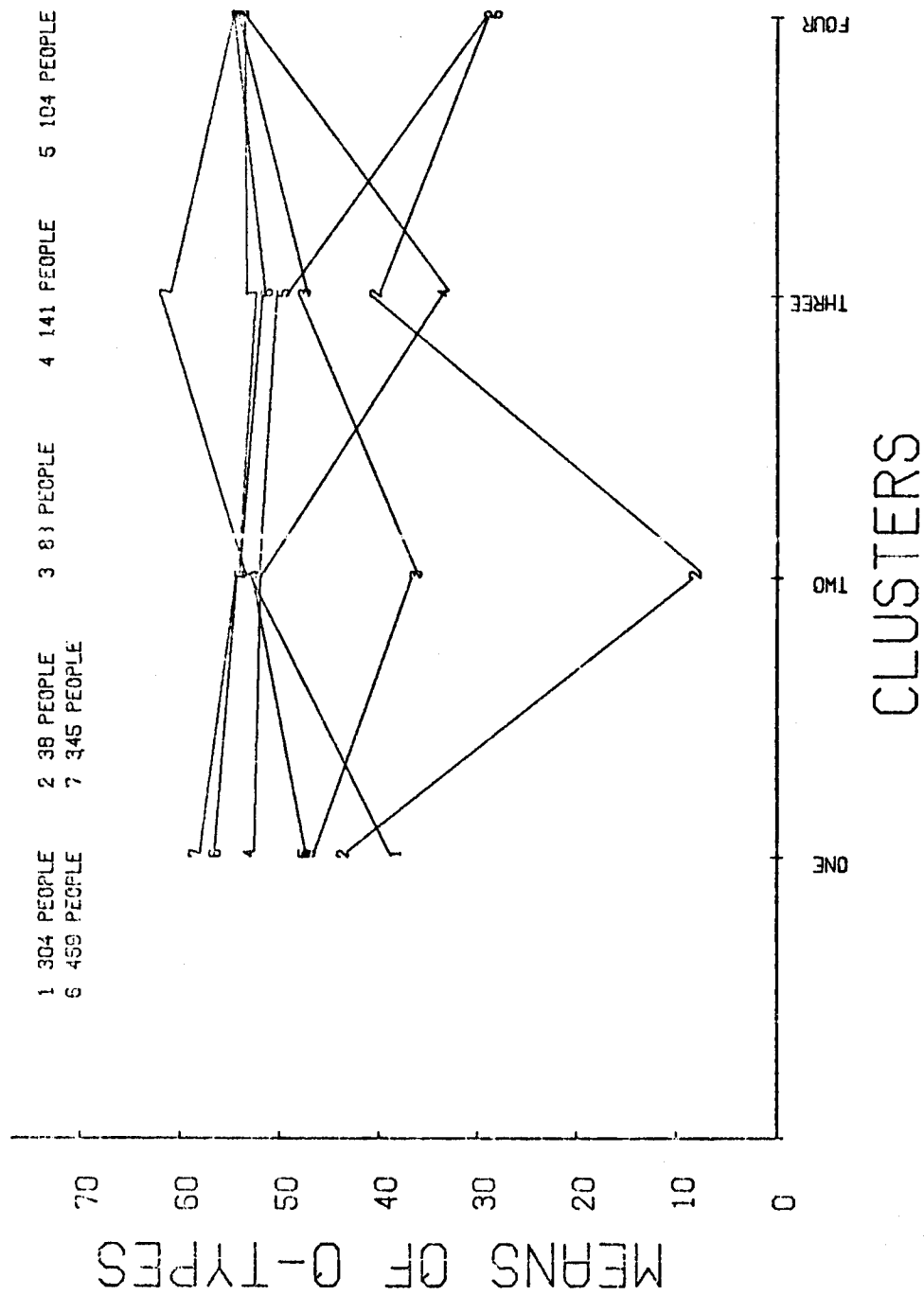


Figure 4. O-type Profiles on "True-False" Questions

complainers who regularly give negative feedback to the National Park Service.

Management Implications

The cluster analysis results can become a useful tool of policy-making institutions. Both the Park Service and the outfitters should gain some understanding of the variables that comprise each of the clusters, and look at the profiles of the people, noting the size of each of the O-types. This will enable them to know more about the people who make river trips, and thus, to better determine the type of trips desired. Further, when an individual plans to participate in a river trip, this analysis might be useful in directing the individual to the type of trip that will best fulfill his wants.

CHAPTER V

CONCLUSIONS

A Colorado River trip is a unique experience, presenting new management problems and considerations. The intent of past policy decisions has been to protect the resource amenity and to improve the recreational experience. These decisions were made with limited user data: socio-economic characteristics; reasons people take river trips; environmental impacts; trip impacts on them; individual perceptions, satisfactions, and dissatisfactions; and feelings about management policies. This chapter summarizes the conclusions of the study and the policy implications.

The People

A significant characteristic of the participants in Colorado River trips is their high total family income. With two-thirds reporting annual incomes in excess of \$15,000, one finds a unique group seldom found in other recreation areas. The mean age of the group was 40 years; they are employed, self-employed, housewives, or students. Outdoor activities in which they participate indicate that they are generally outdoorsmen.

The river trips are enjoyable and meaningful experiences for them. Nearly all those sampled said that their river trip was either "super" or "very good." A few seemed bothered by inclement weather. New friends were made and nearly half felt that they had made "lasting" friendships as a result of their trip.

In general, "river-runners" perceive their trip as a learning experience. They gain knowledge about themselves, a better understanding of others, and a stronger feeling for their environment. This learning experience adds to the trip's enjoyment and especially to feelings about the whole experience. The data illustrate that there is more to a river trip than "fun and thrills," and that the participants grow from their experience. The trip is an intense personal experience. Cluster analysis defines several generalized dimensions of the recreational experience and partitions users into groups with common characteristics.

Management Considerations

River trips are not open to everyone, because of the associated time, travel, and monetary costs involved. Therefore, management decisions should reflect this situation. Decision-makers may find that the general philosophy of the Park Service, i.e., making natural resources available to the general public, may have to be re-evaluated

and altered to be effective in managing this particular recreational adventure.

The participants unanimously agreed that regulatory policies are necessary to protect the area for future generations, however, the large majority fail to perceive a crowding problem on the River. This suggests that current user limits may be too low. However, consideration should be given to the group of users who do perceive a crowding problem, even though they are a small minority. Policies ought to preserve the variety of river trips, and special consideration given to those who want a "complete" wilderness experience, e.g., a rowing trip with fewer people.

The environmental carrying capacity of the Colorado River from Glen Canyon Recreation Area to the Lake Mead Recreation Area needs to be defined. This must include both the physical and biological parameters involved in addition to the social carrying capacity. Once determined, allocation models could be developed to schedule river trips and their daily progress. The Colorado River is capable of carrying many more people on more trips, according to the sociological data. Further, by scheduling the trip departures, each trip would experience little or no contact with other expeditions on the River. However, this must be considered in light of the biological carrying capacity.

If the number of users per year is regulated, if people are encouraged to make river trips, and if people are not limited to the total number of trips through the Grand Canyon in their lifetime, then the river trips can become an experience for a small segment of the total population who continually repeat their trip. Since other people do want to make river trips, decision-makers must consider this carefully when initiating regulatory policy. As we have seen, river trips are already limited to that segment of the population that can afford the monetary, travel, and time costs. The question that must be answered is whether user limits will further limit the potential users.

It may not be necessary to regulate river trips for the entire season, but rather, only during the highest use months. Most trips run during June, July, and August with few trips in the other months. If these three months were regulated so that people were encouraged to make their trips during other months, more people could enjoy the experience.

There is much work left to be done on the River, both of a biological and sociological nature. This paper has presented some of the socio-economic considerations. These results should be coupled with those from biological studies to provide the necessary input into the policy-making process.

GLOSSARY¹

Collinearity

The complete objective feature that describes the similarity of the definers of a cluster and their difference from other clusters. Clusters of collinear variables have two objective characteristics of similarity: they correlate positively with each other, and they follow the same pattern of correlation with other variables. The degree of collinearity of the correlation profiles of any two variables can be measured objectively, indicating the degree to which the correlations of the two variables are consistently proportional across all the other variables of the study.

Communality

A number between 0.00 and 1.00 that measures the generalities of individual differences in the variable. A communality close to 1.00 indicates that there is a relatively high correlation between the variables.

Factor Score

Sum of the definers for any particular observation.

Homogeneity

A measure of the "tightness" of the profiles of individuals that compose a given O-type. It is a function of the within-variance of the group's cluster scores compared to the total variance of individuals in the full supply.

O-type

The result of an object cluster analysis, or the simple groupings of the objects.

Orthogonal

Non-correlated variables, i.e., variables at right angles to each other.

1. Tryon and Bailey, 1970.

Reliability

The reliability coefficient of a cluster score, or of any composite, is defined as its correlation with a second composite consisting of definers "strictly comparable" to the existing first set. This gives a measure of how well one can expect to reproduce the given cluster if he draws another sample.

Total generality

Percentage of the communality explained by the cluster.

Total variability

Percentage of the generalized variance explained by the clusters.

APPENDIX A

INTRODUCTORY LETTER AND QUESTIONNAIRE



THE UNIVERSITY OF ARIZONA

TUCSON, ARIZONA 85721

COLLEGE OF EARTH SCIENCES

DEPARTMENT OF HYDROLOGY AND WATER RESOURCES

TEL. (602) 884-3131

Dear Fellow River Runner,

Please allow me to introduce myself. I am Mark Boster and I am currently a graduate student in Water Resources Administration at the University of Arizona. Over the past few years, I've developed an interest in outdoor recreation; especially in those activities that are water dependent. This is why I am writing to you asking for your help.

As part of the requirements for my Master of Science degree, I have elected to study and obtain data in one particular area of the Grand Canyon: The Colorado River Trips. By sampling the opinions of past river runners, it is felt that information can be obtained that will be extremely valuable to the National Park Service and to the Colorado River Outfitters; helping to assure a good continued working relationship between them, and the preservation of this natural resource. Your name has been selected from trip rosters provided by the Park Service to help in this study.

If you will please complete the enclosed questionnaire and return it to me, I will be able to analyze this valuable information and pass it along to the Park Service and the Outfitters. I have tried to keep the questionnaire as short as possible to minimize your inconvenience. Also, your questionnaire has been numbered to assure your anonymity. Remember, because you have made a river trip, your opinion is very important!

Thank you for your time.

Sincerely,

A handwritten signature in cursive script that reads "Mark Alan Boster".

Mark Alan Boster

Questionnaire: COLORADO RIVER TRIPS

UNIVERSITY OF ARIZONA - TUCSON, ARIZONA
Department of Hydrology and Water Resources

PLEASE FILL IN THE FOLLOWING INFORMATION:

Age: _____ Sex: _____

Please mark the appropriate occupational status when you took the trip.

- Student (Level _____)
 Employed (Vacation time: _____ days per year)
 Self-Employed (Vacation time: _____ days per year)
 Housewife
 Retired
 Other _____

Which category comes closest to representing your total family income?

- \$5,000 and under \$10,000 to \$14,999
 \$5,001 to \$7,999 \$15,000 to \$19,999
 \$8,000 to \$9,999 \$20,000 and over

Please mark other outdoor activities in which you commonly engage:

- | | | |
|----------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------|
| a. <input type="checkbox"/> Hunting | g. <input type="checkbox"/> Tennis | l. <input type="checkbox"/> Water skiing |
| b. <input type="checkbox"/> Fishing | h. <input type="checkbox"/> Swimming | m. <input type="checkbox"/> Snow skiing |
| c. <input type="checkbox"/> Back-packing | i. <input type="checkbox"/> Mountain climbing
with equipment | n. <input type="checkbox"/> Hiking |
| d. <input type="checkbox"/> Horseback riding | j. <input type="checkbox"/> Bicycling | o. <input type="checkbox"/> Wildlife photography
and sketching |
| e. <input type="checkbox"/> Boating | k. <input type="checkbox"/> Camping | p. <input type="checkbox"/> General sightseeing |
| f. <input type="checkbox"/> Golf | | |

Of the activities listed above, which do you normally engage in during your vacations? Please circle below all that are applicable.

a b c d e f g h i j k l m n o p

How many river trips have you made through the Grand Canyon? _____

Of these, how many were rowing trips? _____

How long was your last river trip through the Grand Canyon? _____ days

On your most recent Colorado River trip, how many members of your family accompanied you? _____

How many did not accompany you? _____

Please specify those who did accompany you

- Spouse Children
 Mother Brother
 Father Sister
 Other (Please specify _____)

How long had you anticipated going on a river trip?

- Less than two months 1-2 years
 2-6 months 2-5 years
 6-12 months Longer than 5 years

What sources of information did you have about the trip? Mark all those that are applicable.

- Friends or relatives who had made the trip
 Brochures from trip operators, organizations, clubs, etc.
 Newspapers, magazine articles, or books
 Movies
 Travel agent
 Others (Please specify: _____)

How would you classify the weather during your last river trip?

- Super
- Very good
- Good
- Poor
- Dismal

How did you enjoy your trip?

- Super
 - Very good
 - Good
 - Poor
 - Dismal
- Please comment: _____

Approximately how many people were on the river trip you took?

- 1-5
- 6-10
- 11-20
- 21-30
- 31-40
- 41-50
- More than 50

Was this:

- too few
- too many
- about right

Of the new people that you met on your trip, have you

- corresponded with any once or twice?
- developed a regular correspondence with any?
- gotten together with any since your trip?
- plan to get together in the future?

Please circle either "YES" or "NO" for the following questions:

- YES NO Have you taken similar river trips down other white water and/or wilderness rivers?
 If YES, about how many? _____
- YES NO Was sufficient pre-trip information provided by the outfitter?
- YES NO Do you wish that you had read more educational material on the Grand Canyon and the Colorado River before your trip?
 If YES, of what type? _____
- YES NO Did you go on a group-planned trip (outdoor club, conservation group, church, etc.)?
- YES NO Was the river trip the major activity on your vacation?
- YES NO During the trip, did your group see any other parties or groups on the river? If YES, was it:
 Very annoying Not annoying
 Annoying Reassuring
 Tolerable Enjoyable

Please explain: _____

YES NO Did your trip reinforce or change your conservation values? In what way: _____

YES NO Do you feel that you had enough time for exploring on your trip?

YES NO Do you feel that you had enough time for relaxation on your trip?

YES NO Do you expect to take more Colorado River trips through the Grand Canyon? If YES, would you take:

() a longer trip?

() a shorter trip?

() the same length trip?

YES NO Do you plan to run other wilderness and/or white water rivers?

YES NO Were you encouraged to leave your campsites in better condition than when you had found them?

YES NO Did you find what you were looking for on the trip?

YES NO Did the boatmen make your trip more enjoyable by pointing out natural phenomena?

YES NO Did you develop any lasting friendships on your trip?

YES NO Did aircraft flights over the canyon detract from your trip?

YES NO A river trip is something I would do more often if I had more time.

YES NO I would go on more river trips if I had more money.

YES NO I believe that no one has the right to take more than one river trip through the Grand Canyon.

YES NO Should people be encouraged to take river trips within the Grand Canyon?

YES NO Do you consider an outboard motor a necessary part of a safe, pleasurable trip?

YES NO Should more developments like the Phantom Ranch be built along the Colorado River?

YES NO Do you believe that the Colorado River should be maintained as a wilderness river within the Grand Canyon?

YES NO Should campsites along the river be improved? If YES, how? _____

YES NO Should the number of people taking river trips through the Grand Canyon be limited?

If YES, would you have been disappointed in having to postpone your trip? YES NO

APPENDIX B

ADDITIONAL DATA TABLES NOT PRESENTED IN THE TEXT

Table 14. Individual Outfitter Representation in the Sample

Outfitter	Number in Sample	Percentage of Sample
American River Touring Assoc.	231	15%
Arizona River Runners	22	1%
Cross Tours	179	11%
Fort Lee Company	9	1%
George White	136	9%
Gooch-Wendt Expeditions	4	< 1%
Grand Canyon Expeditions	176	11%
Harris Boat Trips	3	< 1%
Hatch River Expeditions	252	16%
Mexican Hat Expeditions	6	< 1%
Moki Mac River Expeditions	4	< 1%
Rowlands River Runners	--	--
Sanderson Brothers	316	20%
Tour West	16	1%
Western River Expeditions	168	11%
White Water River Expeditions	39	2%
Wonderland Expeditions	17	1%

Table 15. Age Distribution for Colorado River Trips

Age	Number in Sample	Percentage
1-5	0	---
6-10	1	0.06%
11-15	31	1.96%
16-20	116	7.35%
21-25	135	7.92%
26-30	163	10.32%
31-35	177	11.21%
36-40	175	11.08%
41-45	209	13.24%
46-50	206	13.05%
51-55	144	9.12%
56-60	112	7.09%
61-65	56	3.54%
66-70	32	2.02%
71-75	11	0.69%
76-80	8	0.50%
No answer	12	0.76%

Table 16. Occupational Data

Occupation	Number in Sample	Percentage of Sample
Student	251	16%
Employed	757	48%
Self-employed	288	18%
Housewife	191	12%
Retired	46	3%
Other	39	2%
No answer	6	< 1%

Table 17. Student Grade Distribution

Grade	Number in Sample	Percentage of Sample	Grade	Number in Sample	Percentage of Sample
1	--	--	9	17	7%
2	--	--	10	25	10%
3	1	< 1%	11	20	8%
4	--	--	12	32	13%
5	4	2%	13	19	8%
6	3	1%	14	22	9%
7	5	2%	15	20	8%
8	10	4%	16	24	10%
			Grads.	38	15%
			Total	250	

Table 18. Number of Rowing Trips by Individuals in the Sample

Number	Number in Sample	Percentage in Sample
0	1,484	94.16%
1	77	4.88%
2	11	0.69%
3	3	0.19%
4	1	0.06%

Table 19. Number of Days of Last Trip

Number of Days	No. in Sample	% in Sample	Number of Days	No. in Sample	% in Sample
1	1	0.06	10	465	29.46
2	1	0.06	11	52	3.29
3	42	2.66	12	32	2.02
4	201	12.73	13	5	0.31
5	185	11.72	14	19	1.20
6	132	8.36	15	3	0.19
7	122	7.73	16	2	0.12
8	115	7.28	17	1	0.06
9	185	11.72			

Table 20. Length of Anticipatory Period for River Trip

Length	No. in Sample	% of Sample
Under 2 months	176	11
2-6 months	532	34
6-12 months	404	26
1-2 years	239	15
2-5 years	120	8
over 5 years	103	7
No answer	4	< 1

Table 21. Classification of the Weather

Weather	No. in Sample	% of Sample
Super	621	39
Very Good	643	41
Good	259	16
Poor	35	2
Dismal	11	1
No Answer	6	< 1

Table 22. Vacation Time Distribution for Employed and Self-Employed Respondents

Number of Days	No. in Sample	% of Sample
1-5	6	0.57
6-10	94	9.00
11-15	210	20.11
16-20	100	9.57
21-25	153	14.65
26-30	250	23.94
31-35	16	1.53
36-40	6	0.57
41-45	6	0.57
46-50	2	0.19
51-55	3	0.28
56-60	22	2.10
61-65	0	---
66-70	1	0.09
71-75	12	1.14
76-80	8	0.76
81-85	1	0.09
86-90	52	4.98
91-95	1	0.09
96-100	8	0.76
More than 100	11	1.05
No Answer	82	7.85

Table 23. Monthly Distribution of River Trips

Month	No. in Sample	% of Sample
January	--	--
February	--	--
March	100	6
April	139	9
May	174	11
June	415	26
July	234	15
August	338	21
September	164	10
October	14	1
November	--	--
December	--	--

Table 24. Perception of Trip Enjoyment

Perception	No. in Sample	% of Sample
Super	1,058	67
Very Good	427	27
Good	82	5
Poor	5	< 1
Dismal	--	--
No Answer	6	< 1

Table 25. Number of Trips taken by Individuals in the Sample

Number of Trips	No. in Sample	% of Sample
1	1370	86.81
2	145	9.18
3	35	2.21
4	16	1.01
5	3	0.19
6	2	0.12
7	2	0.12
8	--	--
9	1	0.06
10	1	0.06
11	1	0.06

Table 26. Results of "Yes-No" Questions

Questions	% "Yes"	% "No"	% no Answer
Have you taken similar river trips down other white water and/or wilderness rivers?	26	73	1
Was sufficient pre-trip information provided by the outfitter?	91	7	2
Do you wish that you had read more educational material on the Grand Canyon and the Colorado River before your trip?	49	49	2
Did you go on a group-planned trip?	41	58	1
Was the river trip the major activity on your vacation?	87	12	2
During the trip, did your group see any other parties or groups on the river?	91	9	--
Did your trip reinforce or change your conservation values?	72	25	3
Do you feel that you had enough time for exploring on your trip?	50	49	1
Do you feel that you had enough time for relaxation on your trip?	91	8	1

Table 26.--Continued. Results of "Yes-No" Questions

Questions	% "Yes"	% "No"	% no Answer
Do you expect to take more Colorado River trips through the Grand Canyon?	66	32	2
Do you plan to run other wilderness and/or white water rivers?	70	24	6
Were you encouraged to leave your campsites in better condition than when you had found them?	90	10	1
Did you find what you were looking for on the trip?	94	2	4
Did the boatmen make your trip more enjoyable by pointing out natural phenomena?	86	12	2
Did you develop any lasting friendships on your trip?	44	52	4
Did aircraft flights over the canyon detract from your trip?	13	86	1
A river trip is something I would do more often if I had more time.	77	20	3
I would go on more river trips if I had more money.	57	37	6
I believe that no one has the right to take more than one river trip through the Grand Canyon.	6	89	5

Table 26.--Continued. Results of "Yes-No" Questions

Questions	% "Yes"	% "No"	% no Answer
Should people be encouraged to take river trips within the Grand Canyon?	55	38	7
Do you consider an outboard motor a necessary part of a safe, pleasurable trip?	60	33	7
Should more developments like the Phantom Ranch be built along the Colorado River?	7	91	2
Do you believe that the Colorado River should be maintained as a wilderness river within the Grand Canuon?	97	2	1
Should campsites along the river be improved?	32	65	3
Should the number of people taking river trips through the Grand Canyon be limited?	77	19	4

Table 27. Results of the "True-False" Questions

A trip down the Colorado River--	Before		After	
	% "True"	% "False"	% "True"	% "False"
(a) is a wilderness experience.	93	4	92	5
(b) allows communion with Nature.	91	5	93	4
(c) has moments of danger.	82	14	80	17
(d) is something my friends would like to do.	73	20	77	16
(e) allows one to get away from pollution.	81	12	64	29
(f) allows one to learn about himself.	55	33	65	25
(g) allows one to gain communion with God.	49	33	56	28
(h) allows one to observe the beauty of Nature.	96	1	97	< 1
(i) allows one to learn about other people.	69	24	83	12
(j) allows one to test his physical abilities.	61	33	62	33

Table 27.--Continued

	Before		After	
	% "True"	% "False"	% "True"	% "False"
A trip down the Colorado river--				
(k) allows one to enjoy the companionship of camp life.	88	7	91	6
(l) is a unique experience	94	2	95	1
(m) allows one to learn about Nature.	91	4	93	4
(n) allows one to express artistic talent through photography, sketching, etc.	76	14	82	11
(o) allows one to get away from the impersonal urban environment.	89	5	90	4
(p) increases one's understanding of the man-environment relationship.	76	15	85	9
(q) is full of excitement and adventure.	92	4	91	6
(r) allows one to "get away from it all."	88	7	86	10
(s) allows one to get away from people.	54	38	36	57
(t) allows one to get away from the technology of civilization	79	15	73	22

APPENDIX C¹

INTERIM CARRYING CAPACITY AND MANAGEMENT GUIDELINES FOR COLORADO RIVER TRIPS

To assure protection of the river environs from human over-use, and to provide for a primitive river experience, interim capacity guidelines have been developed.

- (1) The number of outfitters will not exceed the number who were granted permits in 1970.
- (2) The maximum number of people-days on commercial trips will approximate the number of such people-days in 1970.
- (3) Motor noise and pollutant emissions from motors will be reduced to an acceptable standard. If not achieved by January 1, 1974, motors will be eliminated.
- (4) Trips will be scheduled so that they average not more than 50 river miles a day.
- (5) All commercial operations will come under the Concessions Policy Act of 1965 (PL 89-249) and related policy and regulations.
- (6) No upriver trips will be allowed for reasons of safety and wilderness character preservation.
- (7) Helicopter takeout of passengers, employees, or equipment on national park lands is prohibited except for emergencies.
- (8) Launching and takeout points will be improved to handle established carrying capacity. Specifically, the Service will cooperate with the Hualapai Tribe to develop Diamond Creek as a main input-takeout point for people and boats; also Whitmore Wash will be developed as an input-takeout point for passengers (no mechanical access).

1. U. S. National Park Service, 1971.

APPENDIX D

A COMPARISON OF INCOME LEVELS OF COLORADO RIVER PARTICIPANTS TO THE SEVEN NATIONAL RECREATION AREAS¹

Total Annual Family Income	Bob Marshall	Gila	Great Smoky	Sierra	Mt. Marcy	BWCA	Yellowstone-Teton	Colorado River Trips
\$5,000 or under	15%	14%	22%	9%	32%	27%	28%	3%
\$5,001 to 7,999	28%	43%	38%	23%	27%	18%	25%	4%
\$8,000 to 9,999	--	10%	9%	20%	12%	14%	16%	6%
\$10,000 to 14,999	24%	14%	6%	25%	19%	21%	14%	20%
\$15,000 to 19,999	6%	--	6%	11%	7%	14%	3%	17%
\$20,000 and over	27%	19%	19%	12%	3%	6%	14%	47%
	<u>100%</u>	<u>100%</u>	<u>100%</u>	<u>100%</u>	<u>100%</u>	<u>100%</u>	<u>100%</u>	<u>97%</u>
Sample size	33	21	32	179	101	86	36	1578

NOTE: These data are not adjusted to present value.

1. Compiled by the Outdoor Recreation Resources Review Commission.

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