GEOGRAPHIC PATTERNS OF WINTER RECREATION: AN ANALYSIS
OF THE SPATIAL TRAVEL BEHAVIOR OF ARIZONA SKIERS

by

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STATEMENT BY AUTHOR

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ABSTRACT

Since the beginning of this century, recreational activities in the United States have increased significantly in importance, both at the individual level and on the national one. Increased demands have greatly taxed the resource-based facilities of this nation. While the majority of outdoor recreational activity occurs during the "warm weather" portions of the year, an increasing segment of the American populace have engaged in winter sport activities.

One hundred and thirty-nine questionnaires were administered to Arizona residents who actively engaged in recreational skiing during the 1970-1971 ski season. Travel patterns were evaluated in terms of the following criteria: (1) accessibility of different ski facilities, (2) the financial background of the individuals, and (3) the experiential history of the skiers.

The travel patterns were strongly influenced by the distance/time factor. However, as the amount of leisure time available for recreation increased, factors other than distance; i.e., the varying amenities among ski facilities, influenced movement. Variations in travel patterns do not appear to be significantly related to variations in personal income or the previous skiing experience of the sample populace.
CHAPTER I

RECREATIONAL ACTIVITY IN AMERICA

Introduction

During the past four decades, there has been a rather drastic alteration of the leisure time behavior of the American citizenry. Alteration of leisure time behavior can be attributed to several operative forces which include: (1) an increase in discretionary income, (2) a decrease in the number of working hours, (3) a change in attitude toward leisure time, and (4) an expanded mobility due primarily to improvements in transportation. Discretionary income, that is, excess capital after meeting all the costs of daily living, has expanded considerably within the last thirty years. At the beginning of the Sixties, a total of 34 million American families had at their disposal some $83 billion for non-essential expense, nearly one-half of which was utilized for recreational purposes (Coughlin 1959, p. 69). This amounted to a total as large as the yearly national defense budget for that period (Yukic 1963, p. 52).

In addition to non-essential capital, Americans also were blessed with additional time not directly associated with earning one's living and maintaining a home. Changes brought about by the introduction of mechanical labor and
technological improvement have generally increased hourly production and reduced the worker's load. Increased output was possible with less time required per unit produced; the average work week in America has declined steadily since the Industrial Revolution thus increasing the availability of leisure time. In 1850, according to Clawson and Knetsch (1969, p. 16), the typical American worked 70 hours per week. Corresponding figures for different time periods were in 1900, 60 hours; 1920, 50 hours, and currently, about 38 hours per week. This means that the industrial worker of the Sixties enjoyed nearly twice as much leisure time as his counterpart in 1900, and nearly one additional day of leisure more per week than the worker of 1920 (Dulles 1965, p. 388).

Furthermore, not all members of today's society subscribe to the long held American dream of achieving great power and wealth in the community through devotion to hard work and a drive to get ahead. A growing proportion of our society wants an "opportunity to demonstrate the special skills and aptitudes they possess and to achieve some measure of moderate financial and economic security" (Yukic 1963, p. 59). Instead of using leisure time as a preparation period for the following work day, Americans are using leisure time for relaxation and recreation. Finally, leisure time activities have been substantially
altered by the increased mobility afforded to most Americans. With improved transportation, the difficulty in circulation experienced by the 19th century citizen has been dramatically reduced. Whereas per capital travel in 1900 was about 480 miles annually, average figures at mid-century had increased tenfold (Clawson and Knetsch 1969, p. 5). With added mobility, greater non-essential capital, shorter work weeks, and a change in attitude, leisure time can be readily enjoyed at locales some distance from the home.

Of total leisure time, only about four percent is allocated to recreational pursuits (Clawson and Knetsch 1969, p. 26). Despite its limited temporal percentage, recreation has substantial significance if considered in terms of importance to the economy of the nation and demands placed upon physical facilities. Slightly more than five percent of the nation's annual consumer expenditures are associated with recreation (Yukic 1963, p. 51). Yet, this figure could rise even higher if participation in recreation continues to expand at its present rate. During a five-year period from 1960 to 1965, the number of recreational outings in the United States increased by 51 percent, from slightly over 4.25 billion occurrences in 1960, to 6.2 billion ratings in 1965 (U. S. Department of the Interior 1967).

While overall participation during this period continued to expand at a phenomenal rate, those activities
which stressed "physical" stimulation experienced the greatest increase in number of enthusiasts. The shifting of emphasis towards more active recreational activities reflects the influences of a variety of forces. First, the Kennedy Administration at the beginning of the decade promoted physical fitness both by proclamation and by example. From Hyannisport, the vacation retreat of the President, the news media forwarded stories of the President and the rest of the Kennedy clan at play. Public interest in various recreational activities was aroused. Sailing and horseback riding attracted new enthusiasts, while touch football became the fashionable activity of the "Ben Gay" set.

Secondly, during the first half of the decade professional sporting events were receiving increased television coverage which promoted a widespread interest in athletics. Subsequently, many Americans, in an attempt to retain or return to physical fitness, sought more active recreational involvement. Evidence of the trend towards more active forms of recreation is revealed in a study conducted by the U. S. Department of Interior (1967). According to the report, "driving for pleasure," a passive recreational pursuit, was the number one leisure-time outing among Americans in 1960. However, by 1965, "driving for pleasure" was subordinate to two more active recreational pursuits—"walking for pleasure" and "swimming" (Table I).
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<thead>
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<th>Rank</th>
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<td>Walking for Pleasure</td>
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<td>2</td>
<td>Swimming</td>
<td>2</td>
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<tr>
<td>5</td>
<td>Sightseeing</td>
<td>5</td>
<td>Bicycling</td>
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<td>6</td>
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<td>Sightseeing</td>
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While outdoor recreational activities are generally associated with the "warm weather" months of the year, increasing participation in winter outdoor activities occurred during the early Sixties. During the period from 1960 to 1965, winter recreational activities enjoyed a considerable increase in the number of enthusiasts, especially skiing, a leisure time activity in which participation more than doubled (see Table II).
<table>
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<td>Horseback Riding</td>
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<td>10</td>
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CHAPTER II

SKIING AS A LEISURE TIME ACTIVITY

The emergence of pleasure skiing as an important segment of winter recreational activity is a rather recent occurrence; much of the participation prior to the 1930's was limited to a handful of hearty individuals who frequently contested their skills in competitive Alpine or Nordic events. Although such contests generated considerable spectator appeal, there was little in the way of actual participation by the layman. During the Thirties, however, three innovations—the mechanical "uphill" lift device, the "snow train," and the resort-type facility—provided the impetus which spurred interest and participation in recreational skiing (Carlson 1942).

First of all, uphill lift devices, although mechanically crude by today's standard, eliminated the time-consuming, energy-draining drudgery of hill climbing and increased the vertical range of the skier, making more of the mountain accessible. Second, "snow train" service initiated by several railroad corporations during the 1930's provided a reliable means of transportation between population centers and the resource based ski facilities. Thus,
the urban dweller was afforded an equal opportunity to participate in a recreational pursuit previously confined to persons living in the rural environs. And third, during the decade of the Thirties, the resort-type ski facilities were introduced to the American public. Such facilities provided for all of the skiers' entertainment needs—prior to, during, and apres-ski, and was designed to accommodate skiers for extended weekend and vacation trips.

By 1950, the number of resort-type facilities in the United States had increased to approximately forty (Bowen 1963). Correspondingly, the number of recreational skiers had increased from a handful at the beginning of the 1930's to several hundred thousand by 1950. By mid-century, according to The Book of American Skiing (Bowen 1963), the "business of skiing" matured as a commercial enterprise:

The year 1950 was one of change . . . it . . . marked the end of the old ways for all American skiing. Up to that time, an American resort was a cheerful but unprofitable experiment, and the customers were mainly college kids and a few rich people out for laughs.

From now on, it was going to be different. Skiing was going to make a major bid . . . for an important segment of the country's winter tourist trade (pp. 154-155).

*The difficulties encountered in accurately measuring the growth of the sport of snow skiing are reviewed in Chapter 13, "Skiing," Tourism and Recreation (United States Department of Commerce, 1966, p. 157).
Since mid-century, activity in skiing has accelerated tremendously. The Bureau of Outdoor Recreation (United States Department of Interior 1971) estimates that about four percent of the American populace is currently active in skiing. Some 780 mechanically-equipped ski facilities operative in forty states provide services to nearly six million winter recreational enthusiasts (United States Department of Interior 1967; Barry 1970, p. 154; "Families on Skies," 1970, p. 98).

Skiing in the Western United States and Arizona

Since the fostering of America's first resort-type ski complex at Sun Valley, Idaho, in 1934, the mountainous areas of the Western United States have provided the geographic backdrop for the location of what is considered by many experts to be the best skiing available in this country or elsewhere:

When all is said and done, this is where it's at: the big mountains, the deep powder, the marvelous sunshine, the zinging night life—the complete ski vacation. . . . if you want to experience the best this country offers, or as many insist, the best in the world, Go West (Greenberg 1971, p. 151).

Ski facilities are situated throughout the vast expanse of the American West (Fig. 1) from the Pacific Coastal Range eastward to the Black Hills of South Dakota, southward from the Canadian frontier to an area where the meaning of "winter recreation" is perceived differently, as recorded in
Fig. 1. Ski Facilities in the Western United States, 1970
a publication of the United States Department of Agriculture (1941) describing winter recreational activity in the Coronado National Forest of Southern Arizona:

... The terms "winter" and "winter sports," when applied to the Coronados have a meaning the opposite of that elsewhere. ... Winter visitors here are seeking a continuation of Indian (sic) summer and complete avoidance of snow, which generally is a sought-after essential of the winter resort business (p. 3).

However, continuing further, the report states (p. 4): "Mt. Lemmon, rising abruptly to the north of Tucson, becomes snow-capped and provides local residents an opportunity for winter outings." Therefore, despite its southerly location, the higher elevations of Arizona provide potential sites for the development of winter sports centers. Currently, four ski facilities are operative in the state: the Arizona Snow Bowl, near Flagstaff; the Williams Ski Area, near Williams; the Mt. Lemmon Ski Area, near Tucson; and the Sunrise Ski Area, near Greer.

Arizona Snow Bowl

The Snow Bowl was again moved in 1952 to its present site, following a fire which destroyed the lodge. By 1957 a new lodge began operation. Further improvements were undertaken in 1957 and 1962. In 1957, a French Poma lift was installed which rose 2800 feet from the lodge area to the crest of Humphrey Peak. Five years later, the Poma was replaced by a chair which produced a more convenient means
of access to the seven miles of slopes and trails. This improvement contributed to expanded attendance figures. The year before the chair was installed, 78,000 visits were recorded at the Snow Bowl (Nixon 1962), while during the following year attendance increased to over 100,000 visitors ("Northern Arizona" 1961, p. 13E).

Presently the Arizona Snow Bowl has three permanent lifts and four temporary lifts which can transport skiers uphill at the rate of about 2000 per hour.* The vertical lift devices give access to nine slopes and fourteen trails (The National Survey 1970). The area is open to the public approximately 120 days annually.

**Williams**

Establishment of the Williams ski area is also attributed to the leadership of Ed Groesbach (Hayden 1950). In March of 1946, he and several skiers from Williams persuaded Coconino County, the Forest Service, and the city of Williams to set aside 850 acres for a winter sports area. While money for a tow was being gathered through the sale of non-interest bearing notes during the summer of 1946, trails were cut on the hills of the sports area. The following

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*This and other information which deals with the physical characteristics of Arizona ski facilities was obtained by personal correspondence between the author and the managers of the facilities.
winter, the area was dedicated. Since its establishment, the area has grown only slightly. Today, the facility offers both a Poma lift and a rope tow. Together these devices permit access to three trails about 110 days annually.

**Mt. Lemmon**

While winter cyclonic storms are more frequent in the northern portions of the state, the storm track occasionally extends southward dropping winter precipitation in southern Arizona. At the higher elevations precipitation is frequently in the form of snow. As is mentioned above, this affords the residents of the southern portion of the state nearby areas in which to engage in winter recreational activities. With the completion of the Hitchcock Highway in 1947, Mt. Lemmon became the most accessible winter sports area in the southern portion of the state.

In 1948, the Forest Service cut several ski trails in the Bear Wallow vicinity which, according to "Mount Lemmon Story" (1948), provided "a quarter mile ski run and several shorter ones, plus a ski tow. . . ." During the decade of the Fifties, the area was moved further upslope to its present location. Today, the area includes two uphill devices, a Poma lift which has a vertical rise of 850 feet, and a rope tow. Together these devices afford 1000 skiers per hour an opportunity to select a downhill route among two slopes and three trails.
Sunrise

The newest facility in Arizona is the Sunrise Ski Area which began operation during the waning months of the 1970-1971 season. The facility provides a more than adequate replacement for the Big Cienega Ski Area, a facility which was rather unique in that it was incorporated as a non-profit business by residents of the White Mountain region (Cooke 1962). However, being a community corporation, the facility suffered from a lack of adequate financing and in 1969, after thirteen years of operation, the enterprise was abandoned in favor of Sunrise. While Big Cienega was a non-profit organization, the Sunrise Ski Area was developed by federal funding in an attempt to bolster the winter income of the White Mountain Apache Indians.

Included among the facilities at Sunrise are two uphill devices—a double chair lift and a Mighty-Mite cable tow. The former has a vertical rise of 1400 feet and provides access to four slopes and eleven trails. The latter provides uphill assistance to novice skiers on the "bunny slope." The two devices are capable of transporting over 1100 skiers up the slopes in one hour. The area is open approximately 130 days annually.

Statement of Problem

Presumably, if all the facilities within Arizona had the same physical attributes and quality, the spatial
exchange between the cities within the state and the ski areas would exhibit an inverse relationship; that is, as distance from a population center to a particular facility increased, the number of skiers from that population center would decrease. Skiers would choose the area closest to their residences. However, as was described above, differences in site quality exist among the ski facilities within the state and between those areas located beyond the boundaries of the state. Those recreational areas that possess better site attributes can be expected to exert a higher degree of attraction than can those areas of lesser quality. Nevertheless, the final selection of a facility by a skier is not solely determined by physical site qualities. The number of skiers taking advantage of a particular facility is assumed to depend on a number of variables, some of which relate to the facility, and some of which relate to the individual.

This thesis seeks to contribute to a topic of interest in recreational geography which, for the most part, has been slighted (Trotter 1965, Wolfe 1966). A greater understanding of the spatial interactions of recreationists is undoubtedly of considerable importance to outdoor recreational analysis and planning. This study attempts: (1) to identify the travel patterns of a sample group of Arizona skiers, and (2) to examine these travel patterns with
reference to several variables which in previous geographic studies have been shown to exert a considerable influence on travel behavior. Assumedly, recreational travel patterns are a manifestation of rational judgment wherein the skier has carefully considered the many variables which contribute to the overall utility of a recreational journey. While such variables influence each individual differently, it is assumed that the influences are similar enough to contribute to a repetitiveness of pattern among skiers residing in the State of Arizona.
CHAPTER III

THE STUDY DESIGN

Previous Literature

Many of the generalizations concerning the spatial interaction of recreationists have evolved on a deductive basis. Recently, an increasing number of geographers interested in recreation have sought to empirically determine the validity of these assumptions. Analogy models have been borrowed from the physical sciences to test a priori conclusions. One formulation which has proven useful both in assessing ex post facto recreational travel or in projecting the spatial exchange of different leisure time activists is the gravitation model. The basic model relates attendance to distance:

\[ T_{ij} = \frac{P_i P_j}{D_{ij}} \]

where \( T_{ij} \) = the number of people traveling between center "i" and area "j"

\( P_i \) and \( P_j \) = the populations of centers "i" and "j"

\( D_{ij} \) = the distance between center "i" and area "j"

In previous research of recreational movement, several authors found that an inverse relationship exists between
distance and the number of tourists; that is, as the distance between a population center and a recreational area increased, the attendance at that center decreased. Cole and Mitchell (1969) in an examination of attendance of campers at the Great Smokey Mountains National Park used linear regression analysis to measure the relationship between attendance and distance. The computed coefficient of correlation ($r$), -0.89, illustrated a significant negative relationship between the variables. The coefficient of determination ($r^2$) equalled 0.78, which meant that 78 percent of the variation of the points along the line of regression is statistically explained by the distance variable. Similar conclusions regarding the functional relationship between attendance and distance were reached by Deasy and Griess (1966) in a study of mining attractions in Pennsylvania, and by Gibson and Reeves (1972) in a study of camper attendance in the Arizona strip.

However, when applying the gravitational model to the travel behavior of recreationists, other researchers have found it necessary to alter the model somewhat to more accurately describe actual movement. Van Doren (1965) and Trotter (1965) are of the opinion that distance alone is not an adequate measure in accounting for visitor attendance. Attendance appeared to be related in part to site attraction; site attraction being defined in terms of the physical
attributes of the area and the recreational activities offered by the particular facility. The concept of "attractiveness" utilized by Van Doren and Trotter is analogous to Voorhees' (1955) "General Theory of Traffic Movement" which states that "all types emanating from a residential area are attracted or 'pulled' to various land uses with certain empirical values" (p. 49).

In addition to distance and site attraction, several other forces seemingly exert considerable influence on recreational travel patterns. These include: (1) the time allotment available for leisure-time outings, (2) the socio-economic composition of the recreationist, and (3) the experiential background of the recreationist. Time may affect the areal range of the leisure-time activist; the recreationist will often seek a trade-off between travel time and attractiveness of a facility. Travel patterns may be affected by socio-economic or experiential difference. Winsberg (1966) attributes variations in the visitation patterns of Americans traveling in Europe to changes in the socio-economic make-up of the tourist of 1952 and the tourist of 1963. With a trend toward a greater participation among younger, less affluent Americans, average expenditures and trip lengths declined over the eleven-year period under consideration. Gibson and Reeves (1971) found attendance at White Mountain campgrounds in northeastern Arizona
to reflect variations in age profiles and income. Attendance can also be affected by the previous experience of the recreationist. Whereas a certain facility may prove to be quite adequate to the novice, it may be unsatisfactory to the individual who has achieved a degree of expertise in the activity.

If considered in terms of the aforementioned variables, movement between a population center and a recreational site hypothetically takes the form:

\[ T_{ij} = f(P_i, D_{ij}, A_j, S_i, W_i, E_i) \]

where \( T_{ij} \) = the number of people traveling between center "i" and area "j"

\( P_i \) = population of center "i"

\( D_{ij} \) = the distance between center "i" and area "j"

\( A_j \) = the attraction of area "j"

\( S_i \) = a measure of the socio-economic status of the residents of center "i"

\( W_i \) = the "activity desires" of the residents of center "i"

\( E_i \) = a measure of the recreational experience of residents of center "i"

In the past researchers have experienced difficulty in trying to quantify the above variables for various reasons. A continuing problem which has confronted spatial scientists since the pioneering article on recreational geography was published by R. C. McMurray in 1930, has been the absence of secondary data sources. Unfortunately, if
secondary data are available, their validity is oftentimes questionable (Cesario 1969). While this void has been alleviated somewhat by publications of the Bureau of Outdoor Recreation, it is frequently necessary to generate new data for the particular variables required. Additionally, many of the variables used in describing recreational movement defy precise measurement. For example, in the above formulation, the attractiveness variable is not readily quantifiable. In an attempt to overcome this difficulty, several researchers have employed "proxy" values as a measure of attractiveness. For the most part, surrogates have been tangible, physical characteristics, with little consideration given to intrinsic values. While this is a misrepresentation of reality, to specify the multitude of variables that actually contribute to site attractiveness is a prohibitively formidable task since the nature of these variables as well as their relationships to the individual user would vary with each individual. Consequently, what was desired was a substitute value of attraction which exemplified relative quality.

Huff (1965) suggests that park acreage provides a good indicator of the attractiveness of a facility. Ellis and Van Doren (1966) use the number of campsites in different Michigan state parks, while Wennergren and Nielsen (1969) associate the attractiveness of water bodies with
acreage, assuming that as size increases, the number of various recreational activities that can be conducted on that water body will also increase.

Previous Geographic Literature on Skiing

While geographical interest in various aspects of skiing has increased within the past few years (Langdale 1968, Perry 1971, Trail n.d.), a good deal of the previous literature has been provided by governmental studies dealing with the skier and the ski industry in New England and the Western United States (U. S. Department of Commerce 1964, 1965 and 1967). In these studies, attendance was found to be heaviest at those facilities which offered the greatest potential in transporting skiers up the slope. However, no distinction was made as to the origin of the skiers. Certain questions are unanswered in these studies and are examined below. (1) What is the effect of distance upon the spatial interaction of the skier? (2) To what extent does the relative attractiveness of a ski facility influence movement? (3) Are the types of trips taken reflective of variations in socioeconomic or experiential background? (4) Do the travel patterns vary with the place of origin; that is, does a given population center which has a concentration of skiers exhibit a distinctive regional origination?
Methods of Evaluation

In order to empirically ascertain the relative strength of each of the aforementioned variables, certain mathematical manipulations are incorporated in this thesis to augment the analysis of flow diagrams and charts. Specifically, the statistical tests utilized in the thesis include the Chi-Square ($\chi^2$) test and correlation-regression analysis. The former test is applied to the testing of the hypothesis that: (1) variations in trip types are related to variation in socio-economic background, and (2) variations in trip type are related to variations in the experience background of the sample group of Arizona skiers. The latter test is used to measure the strength of the relationship between attendance and distance-attractiveness. In computing the latter, a utility formulation model is used.

The model, which is an adaption of the work on individual choice by R. Duncan Luce (1959), utilizes the conceptual properties of the gravitational formulation; but, instead of focusing on attendance at a particular site, the model is directed toward describing attendance from one point of origin to several alternative sites. In previous application of the model (Huff 1962, Wennergren and Nielsen 1969), attendance was assumed to reflect "user utility"—user utility being influenced by a factor of distance and site quality or attractiveness. Hypothetically, the
probability of an individual selecting a particular recreational site \( (X_i) \) is proportional to the user utility \( (UX_i) \) associated with that site and to the user utility associated with all alternative sites \( (UX_i \ldots UX_n) \).

The probability of a recreationist selecting alternate facilities stated symbolically is:

\[
PX_i = \frac{UX_i}{\sum_{i=1}^{n} UX_i}
\]

\( PX_i \) = Probability of selection for alternate \( X_i \)

\( UX_i \) = Utility associated with alternate \( X_i \)

\[
\sum_{i=1}^{n} UX_i = \text{Total utility associated with all the alternative } (X_1 \ldots X_n) \text{ sites}
\]

The model provides a quantitative means of measuring the relationship between actual attendance and estimated attendance based on the parameter of distance-site attractiveness. If the coefficient of determination between observed and projected attendance is high, this would indicate that the factors of distance and site attractiveness are good "explainer" variables. Conversely, if the coefficient of determination is low, this could indicate: (1) that the two variables do not adequately account for much of the variation, or (2) that either one or both of the variables is misrepresented. Additionally, the formulation provides a
listing of the residuals from regression which provides valuable insight as to which ski facilities strongly deviate from the estimated attendance.

**Data Collection**

In order to make the model operational, certain data were required including: (1) the total number of visits from each center of population to a variety of destinations; (2) a breakdown, by number, of the particular facilities visited by the skiers from each center of population; (3) the distance in miles between each center of population and each facility visited by skiers from that population center; and (4) a measure of the "attractiveness" of each resort visited by Arizona skiers. Since most of the required data were not available from secondary sources, other means of data assemblage were employed.

To collect information on the travel behavior of Arizona skiers, a sample survey was conducted among skiers of the state. In total, 138 interviews were administered, 122 at the Arizona Snow Bowl and Sunrise Ski Area, and 16 at various retail ski shops in Phoenix and Tucson. The latter were collected in an attempt to survey those Arizona skiers who had not utilized facilities within the state during the 1970-1971 ski season. However, the majority of skiers from both samples, approximately 85 percent, visited facilities within the state. Because of limitations of time and
financial backing, no attempt was made to collect a sample survey of Arizona skiers at facilities outside the state.

The questionnaire used in the survey (Appendix) contained three primary sections; each section is designed to generate information of a different nature. Part one of the questionnaire requests information on the individual's ski history. This was considered an important element as the spatial exchange of the individual might possibly be attributable to previous skiing experience. A second section of the questionnaire is directed toward collecting data on socio-economic characteristics. Variations in ski movements might likewise reflect, in part, socio-economic differences. In the third section of questions, the respondents are asked to identify spatial exchange patterns by trip type, trip frequency, and trip route.

Trip types are defined as: (1) daily trips—trips wherein the skier leaves and returns to his place of residence within a twenty-four hour period; (2) weekend trips—trips wherein the skier is away from his residence from one to three nights; and (3) extended vacation trips—trips wherein the skier is away from his residence four or more nights. Trip frequency is defined as one visit to a ski facility by trip type. A trip route is defined as the path traveled by the skier from his residence to the particular
ski facilities mentioned in the questions above. A map is provided the respondent in order to assist in the answering of this question. The indicated routes allow for the computation of driving distance between the residence of the skier and a given facility by comparison of the map with mileage charts.

In addition to spatial exchange data, a measure of site attractiveness is also necessary in the model. To precisely evaluate the attractiveness of an area is a difficult task since it encompasses both tangible and intrinsic qualities. As reviewed earlier, studies by the U. S. Department of Commerce (1964, 1965, and 1967) indicate that attendance to ski facilities is encouraged by physical site attributes, particularly the uphill capacity of a facility. To test the validity of this assumption, a similar measure of site attractiveness is used in this study.

Site quality is defined as annual vertical transport feet capacity. This is the product of the total vertical rise of all lift devices at a facility multiplied by the total lift capacity of all uphill devices multiplied by the length of the season during which the facility operates. Unlike data on recreational travel, physical site characteristics are, for the most part, available through publications of the governmental offices of most states—e.g., "Ski New
Mexico, "New Mexico Department of Development, Tourist Division (1971); "Ski Utah," Utah Travel Council (1971).

In cases where information was unattainable, letters were sent to the particular facilities in question. The annual vertical transport feet of the facilities visited by Arizona skiers is shown in Table III.
<table>
<thead>
<tr>
<th>Facility</th>
<th>Annual VTF (10^5)</th>
<th>Attendance</th>
<th>Facility</th>
<th>Annual VTF (10^5)</th>
<th>Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td></td>
<td></td>
<td>Colorado</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snow Bowl</td>
<td>39,120</td>
<td>793</td>
<td>Aspen</td>
<td>7,094,320</td>
<td>17</td>
</tr>
<tr>
<td>Sunrise</td>
<td>23,660</td>
<td>97</td>
<td>Vail</td>
<td>1,550,465</td>
<td>8</td>
</tr>
<tr>
<td>Williams</td>
<td>6,930</td>
<td>5</td>
<td>Winter Park</td>
<td>760,482</td>
<td>1</td>
</tr>
<tr>
<td>Mt. Lemmon</td>
<td>6,300</td>
<td>45</td>
<td>Steamboat</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Springs</td>
<td>436,800</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Crested Butte</td>
<td>357,280</td>
<td>1</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Loveland</td>
<td>327,600</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Purgatory</td>
<td>73,500</td>
<td>67</td>
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<td></td>
<td></td>
<td></td>
<td>Others</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Utah</td>
<td></td>
<td></td>
<td>California</td>
<td></td>
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</tr>
<tr>
<td>Park City</td>
<td>362,880</td>
<td>11</td>
<td>Squaw Valley</td>
<td>6,690,600</td>
<td>4</td>
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<tr>
<td>Alta</td>
<td>291,060</td>
<td>9</td>
<td>Heavenly Valley</td>
<td>2,723,700</td>
<td>3</td>
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<tr>
<td>Brighton</td>
<td>116,655</td>
<td>2</td>
<td>Mammoth</td>
<td>787,500</td>
<td>3</td>
</tr>
<tr>
<td>Solitude</td>
<td>101,850</td>
<td>3</td>
<td>Others</td>
<td></td>
<td>1</td>
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<tr>
<td>Brianhead</td>
<td>73,780</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>73,780</td>
<td>3</td>
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<td></td>
<td></td>
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<tr>
<td>New Mexico</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sierra Blanca</td>
<td>206,560</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taos</td>
<td>99,960</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lee Canyon</td>
<td>26,950</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idaho</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sun Valley</td>
<td>667,880</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Others</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>1122</td>
</tr>
</tbody>
</table>
CHAPTER IV

THE MOVEMENT OF ARIZONA SKIERS

A compilation of the sample surveys randomly administered to the 139 Arizona skiers reveals three major concentrations of ski enthusiasts within the state, namely the greater Phoenix metropolitan area, Tucson, and Flagstaff. Of these centers, the Phoenix area was, not surprisingly, most heavily represented. Of the total number of skiers interviewed, 73, or 53 percent, reside in the Phoenix area. Thirty-one Tucson skiers constitute 22 percent of the sample, while Flagstaff was represented by 25 skiers, or 18 percent of the total. The remaining 7 percent of the sample, or 10 skiers, resided in smaller communities throughout the state. Six skiers were from the White Mountain region; two from Springerville, one each from Show Low, Lakeside, Pinetop, and McNary. Other communities represented solely by one skier include Coolidge, Globe, Fort Huachuca, and Kearney.

While the spatial exchange of each individual from each population center is unique, this chapter focuses on describing and analyzing the composite regionality of the travel patterns originating from the three major concentration of skiers within the state. Considered first are
the actual travel patterns from each center in terms of (1) the amount of leisure time available, (2) the socio-economic background of the skier, and (3) the previous experience of the participants. Next, the theoretical visitation rates projected by the probability model are discussed and evaluated in regards to observed attendance. Finally, other variables which have affected recreational travel in the past are examined. To facilitate an analysis of movement with variations in time, trip types are considered as either of daily or extended duration.

The Daily Trip

Because skiing is a physically strenuous sport, the distance one can comfortably travel to and from a ski facility within a day's time is limited. If the distance is excessive, the skier may be too exhausted to fully enjoy his day at the slopes. In certain instances the amount of time spent on the slopes may be less than that spent in transit. According to Greenberg in Skiing (1971, p. 88), the area "ought to be within a two-to-two-and-a-half hour drive" as "only a masochist would want to put in more than a total of five hours of driving for a maximum of seven or eight hours of skiing."

To actually spend seven or eight hours on the slopes is difficult since time is usually taken to eat or refresh. The U. S. Department of Commerce (1967) in a study of
Western skiers computed skiing/driving time ratios using five hours as a standard ski day and fifty miles an hour as an average driving speed. Using these criteria the maximum distance which could be traversed in one day where driving time would not exceed skiing time is 250 miles. The average hours of skiing per hour of travel for skiers of the western United States during the 1964-1965 was 1.89. For comparability, skiing/driving time ratios for Arizona skiers are computed in a manner similar to that employed by the Department of Commerce (Table IV).

**TABLE IV**

**SKIING/DRIVING TIME RATIOS FOR ARIZONA SKIERS**

<table>
<thead>
<tr>
<th></th>
<th>Phoenix</th>
<th>Tucson</th>
<th>Flagstaff</th>
<th>White Mountains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snow Bowl</td>
<td>.78</td>
<td>.46</td>
<td>6.25</td>
<td>.74</td>
</tr>
<tr>
<td>Sunrise</td>
<td>.62</td>
<td>.52</td>
<td>.74</td>
<td>5.00</td>
</tr>
<tr>
<td>Williams</td>
<td>.74</td>
<td>.42</td>
<td>3.13</td>
<td>.60</td>
</tr>
<tr>
<td>Mt. Lemmon</td>
<td>.89</td>
<td>3.13</td>
<td>.46</td>
<td>.52</td>
</tr>
</tbody>
</table>

Source: Calculated by author.

**Daily Trips from Phoenix**

Of the three concentrations of ski enthusiasts within the State of Arizona only one agglomeration is beyond an hour's driving distance of a ski facility, specifically,
Phoenix. If considered in terms of Greenberg's remarks (1971), Phoenix area skiers verge on the masochistic. The nearest facility, 140 miles south, is Mt. Lemmon while Sunrise, the area within the state most removed from Phoenix, is 220 miles distant. All Arizona facilities are located beyond that point in space where skiing/driving time are equal. Therefore, the Phoenix area skier spends more time on the road during a daily visitation than he does on the slopes (Table IV).

Despite the inconvenience imposed by travel, over 40 percent of the skiers residing in the Phoenix metropolitan area undertook at least one daily ski journey during 1970-1971. In fact, of the 37 day-trippers residing in the Phoenix area, 28 indicated that the daily trip was the only type of ski journey they had taken during the 1970-1971 ski season. The average distance traveled by the Phoenix skier on daily trips was 175 miles. With the exception of three trips to the Salt Lake City area, all trips were taken in some form of land transportation.

The greatest number of single day skiers were students, followed closely by white-collar workers (Table V). While the mean yearly income ranged from $6,000 to over $25,000, the average was $15,600. In terms of experience, the Phoenix area skier who engaged in daily ski trips averaged more than five years of previous skiing activity.
### TABLE V
VISITS PER 100 MILE INTERVALS, OCCUPATION, INCOME, AND PREVIOUS SKIING ACTIVITY OF PHOENIX AREA SKIERS

<table>
<thead>
<tr>
<th>Type of Trips</th>
<th>Visits Per 100 Mile Intervals</th>
<th>Occupation</th>
<th>Annual Family Income</th>
<th>Previous Skiing Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>136</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>n = 136</td>
<td>n = 37</td>
<td>n = 37</td>
<td>n = 37</td>
</tr>
<tr>
<td>Weekend</td>
<td>139</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>65.9</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>n = 139</td>
<td>n = 50</td>
<td>n = 50</td>
<td>n = 50</td>
</tr>
<tr>
<td>Vacation</td>
<td>60</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>n = 60</td>
<td>n = 45</td>
<td>n = 45</td>
<td>n = 45</td>
</tr>
</tbody>
</table>

*Note: The tables and graphs represent visits per 100 mile intervals, occupation, annual family income, and previous skiing experience for Phoenix area skiers.*

- **Visits Per 100 Mile Intervals**: Numbers range from 0 to 139, with a focus on visits per 100 mile intervals.
- **Occupation**: Categories include White Collar, Blue Collar, Military, Student, Clerical, and No Answer.
- **Annual Family Income**: Income brackets range from below $6,000 to over $100,000, with specific ranges including $6,000-$9,999 and $100,000-$129,999.
- **Previous Skiing Experience**: Experience ranges from 0 to 30 years, with specific categories including 1-2, 3-5, and 10-15 years.
Daily Trips from Tucson

While the distance between Tucson and three of the four ski areas within the state exceeds two hundred miles, this southern center of skiers is within close proximity to the Mt. Lemmon ski area. If the Tucson day-tripper is to visit a ski area in the state other than Mt. Lemmon, the driving time requirements exceed the time spent on the slopes by a margin of almost two to one (Table IV). Because of the excessive distance that must be traveled, only four trips of a total of thirty-nine daily journeys were to areas other than Mt. Lemmon. Of the thirty-one skiers of the sample population who resided in Tucson, fourteen undertook daily trips, six exclusively. In all, eleven skiers visited Mt. Lemmon solely; one skier journeyed to the Arizona Snow Bowl as well as skiing at Mt. Lemmon; another skier traveled to Sunrise; and finally, one skier visited Williams.

The daily spatial exchange of Tucson skiers accounts for about 38 percent of the overall ski movement from that city. This total is less than that of the Phoenix area despite the close proximity of Tucson to Mt. Lemmon. The lower percentage reflects, in part, the poor snow conditions which frequently plague the state's southernmost ski area and the remoteness of other facilities. The average
distance driven on a daily trip by Tucson residents is approximately sixty miles one way.

Eight of the fourteen Tucson day-trippers were students (Table VI). Overall, the daily visitors averaged four years of previous ski activity between them. Average annual family income for the group was in excess of $13,000.

**Daily Trips from Flagstaff**

The residents of the Flagstaff area are in the enviable position of being situated only twenty miles from the state's largest ski facility. Although the trip from Flagstaff to the Arizona Snow Bowl is not as pleasant as most skiers would like because of a poor access road, the facility can be reached in about forty-five minutes. This affords Flagstaff residents the best skiing/driving time ratios within the state (Table IV).

With the exception of one respondent, all of the twenty-five skiers who resided in Flagstaff skied at the Arizona Snow Bowl during the 1970-1971 ski season. Total daily visitations for Flagstaff skiers to the Snow Bowl number 594 trips, an average of 25 visits per skier. Actually, the number of visits to the Snow Bowl by Flagstaff residents varied from two trips by two individuals to eighty visits by one avid ski enthusiast. In all, the
### TABLE VI

**VISITS PER 100 MILE INTERVALS, OCCUPATION, INCOME, AND PREVIOUS SKIING ACTIVITY OF TUCSON AREA SKIERS**

<table>
<thead>
<tr>
<th>Type of Trips</th>
<th>Visits Per 100 Mile Intervals</th>
<th>Occupation</th>
<th>Annual Family Income</th>
<th>Previous Skiing Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>8</td>
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<td></td>
<td>19.5</td>
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<td></td>
<td>n = 39</td>
<td>n = 14</td>
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<td>n = 14</td>
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<tr>
<td>Weekend</td>
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<tr>
<td></td>
<td>43</td>
<td>10</td>
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<td>10</td>
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<td></td>
<td>21.5</td>
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<td>n = 43</td>
<td>n = 19</td>
<td>n = 19</td>
<td>n = 19</td>
</tr>
<tr>
<td>Vacation</td>
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</tr>
<tr>
<td></td>
<td>20</td>
<td>10</td>
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</tr>
<tr>
<td></td>
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<td>n = 20</td>
<td>n = 15</td>
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<td>n = 15</td>
</tr>
</tbody>
</table>

- **Visits Per 100 Mile Intervals**
- **Occupation**
- **Annual Family Income**
- **Previous Skiing Experience**

- Under 100
- 101-200
- 201-300
- 301-400
- 401-500
- 501-600
- Over 700

- White Collar
- Blue Collar
- Housewife
- Military
- Student
- Clerical
- Others

- Below $6000
- 6000-8999
- 9000-11999
- 12000-14999
- 15000-17999
- 18000-20999
- Over 21000
- No Answer

- 1-2 Years
- 3-4 Years
- 5-7 Years
- 8-10 Years
- 11-15 Years
- 16-20 Years
- Over 30 Years
- No Answer
daily trip type accounts for over 95 percent of all movement originating in the Flagstaff area.

If the spatial exchange of the Flagstaff area were to be characterized, it could be said that the movement is predominantly localized—Flagstaff winter sports enthusiasts travel to the Arizona Snow Bowl, regardless of social standing or previous ski experience. When considered in terms of annual family income, Flagstaff day-trippers averaged $17,000, a figure greater than that for the other two cities of agglomerated ski population. This could be due in part to the large number of students in the Flagstaff sample whose basic means of support is from their families. The number of years of active ski participation varied considerably. A large percentage of the Flagstaff population was included in the novice category with only one to two years experience; however, a fifth of the sample population had engaged in ten or more years of activity. Mean number of years of active participation in the sport of skiing totalled five (Table VII).

Extended Trips

While daily visitation patterns are severely hampered by driving requirements, the friction of distance is less critical if the time allotment for a journey is extended. The average distance the Arizona skier traveled
**TABLE VII**

VISITS PER 100 MILE INTERVALS, OCCUPATION, INCOME, AND PREVIOUS SKIING ACTIVITY OF FLAGSTAFF AREA SKIERS

<table>
<thead>
<tr>
<th>Type of Trips</th>
<th>Visits Per 100 Mile Intervals</th>
<th>Occupation</th>
<th>Annual Family Income</th>
<th>Previous Skiing Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Daily</strong></td>
<td>594</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>297</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>n = 594</td>
<td>n = 24</td>
<td>n = 24</td>
<td>n = 24</td>
<td>n = 24</td>
</tr>
<tr>
<td><strong>Weekend</strong></td>
<td>17</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>8.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>n = 17</td>
<td>n = 9</td>
<td>n = 9</td>
<td>n = 9</td>
<td>n = 9</td>
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<tr>
<td><strong>Vacation</strong></td>
<td>12</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>n = 12</td>
<td>n = 9</td>
<td>n = 9</td>
<td>n = 9</td>
<td>n = 9</td>
</tr>
</tbody>
</table>

- Under 100
- 101-200
- 201-300
- 301-400
- 401-500
- 501-600
- 601-700
- Over

- White Collar
- Blue Collar
- Housewife
- Military
- Student
- Clerical
- Others
- No Answer

- Below 65000
- 65000-9999
- 9999-14999
- 14999-19999
- 19999-24999
- 24999-29999
- 29999-35000
- Over

- 1-2 Years
- 3-4 Years
- 5-6 Years
- 7-8 Years
- 9-10 Years
- 11-12 Years
- 13-14 Years
- Over 15 Years
on a daily trip during the 1970-1971 ski season was 48 miles. When the time available was increased and the skier was not required to return to his residence within a 24-hour period from the start of the trip, the distance traversed increased. Whereas 48 miles was the average distance traveled on a daily journey, on a weekend-type trip the distance traveled increased to 323 miles. With still more time, average mileage for a vacation trip increased to 575 miles (Table VIII).

While land transportation again provided the chief means of travel, air transportation increased in importance on extended-type trips. Whereas only one individual utilized air travel for daily journeys, twenty-three individuals employed the airplane as a means of transportation on trips lasting two or more days. While air travel accounted for less than one percent of the total daily trip volume, the corresponding figure for extended trips was more than ten percent of the total.

Phoenix Extended Trips

In the Phoenix metropolitan area, the extended-type trips accounted for almost 60 percent of the movement originating from that center. With an increase in available leisure time, the selection of different ski facilities expanded not only numerically but also spatially. Weekend skiers undertook a total of 139 trips to 11
## TABLE VIII

ATTENDANCE PER ONE HUNDRED MILE INTERVALS FOR ALL OF ARIZONA

<table>
<thead>
<tr>
<th>Distance in Miles</th>
<th>Vacation</th>
<th></th>
<th>Weekend</th>
<th></th>
<th>Daily</th>
<th></th>
<th>Combined</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Absolute</td>
<td>Cumulative</td>
<td>Number</td>
<td>Absolute</td>
<td>Cumulative</td>
<td>Number</td>
<td>Absolute</td>
</tr>
<tr>
<td>0-100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>9</td>
<td>4.2</td>
<td>-</td>
<td>668</td>
<td>81.8</td>
</tr>
<tr>
<td>101-200</td>
<td>4</td>
<td>4.1</td>
<td>-</td>
<td>75</td>
<td>35.9</td>
<td>40.1</td>
<td>127</td>
<td>15.5</td>
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<tr>
<td>201-300</td>
<td>3</td>
<td>3.1</td>
<td>7.2</td>
<td>34</td>
<td>16.3</td>
<td>56.4</td>
<td>19</td>
<td>2.3</td>
</tr>
<tr>
<td>301-400</td>
<td>5</td>
<td>5.2</td>
<td>12.4</td>
<td>12</td>
<td>5.7</td>
<td>62.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>401-500</td>
<td>25</td>
<td>26.1</td>
<td>38.5</td>
<td>47</td>
<td>22.5</td>
<td>84.6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>501-600</td>
<td>10</td>
<td>10.4</td>
<td>48.9</td>
<td>11</td>
<td>5.3</td>
<td>89.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>601-700</td>
<td>20</td>
<td>20.8</td>
<td>69.7</td>
<td>17</td>
<td>8.1</td>
<td>98.0</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>701-800</td>
<td>15</td>
<td>15.6</td>
<td>85.3</td>
<td>2</td>
<td>1.0</td>
<td>99.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>801-900</td>
<td>8</td>
<td>8.3</td>
<td>93.6</td>
<td>-</td>
<td>-</td>
<td>99.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>900 plus</td>
<td>6</td>
<td>6.4</td>
<td>100.0</td>
<td>2</td>
<td>1.0</td>
<td>100.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>96</td>
<td></td>
<td>209</td>
<td>817</td>
<td></td>
<td>1122</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\bar{x} = 575$ miles  
$\bar{x} = 323$ miles  
$\bar{x} = 48$ miles
different areas. The bulk of the exchange was still within the state (Fig. 2), about 70 percent of the total. However, with out-of-state movement, the mean range of the skiers was extended to 292 miles.

Of the 73 Phoenix area skiers, 50 individuals took at least one weekend ski trip during the 1970-1971 ski season; 15 of the 50 took weekend trips only. Both the average income and the number of years of active participation are greater than the corresponding figures for daily trips (Table V). The mean annual income of the Phoenix weekenders was $16,555 while, in terms of experience, the average was nearly six years of previous activity. Of the total number of skiers, one half were employed in managerial or white collar positions.

Both the areal extent and the number of facilities visited by residents of the Phoenix area is understandably greater than trips that last four or more days than on trips of one to three days duration (Fig. 3). Forty-five Phoenix residents took 60 vacation ski trips during which 19 different areas were visited and they traveled a mean distance of 715 miles. Once again the white collar worker comprised the greatest portion of the occupational activities within the group, 47 percent (Table VI). The mean annual income for vacationers as a whole was more than a thousand dollars above the weekend skier; comparatively
Fig. 2. Phoenix Weekend Trips
the incomes were $17,795 to $16,555. As with income, the number of years of active participation in skiing is also higher for the vacation skier, up from six to eight years.

**Tucson Extended Trips**

Of the 39 skiers from the Tucson area, 19 individuals undertook a total of 43 weekend trips. Nearly three-fourths of all weekend movement was beyond the borders of the state (Fig. 4). Skiers traveling to extra-Arizona facilities oftentimes by-passed ski sites within the state. While the weekend travel patterns are diverse, there is southerly orientation not present in the one to three day patterns of the Phoenix or Flagstaff areas. Nearly one-half of the spatial exchange of Tucson skiers was to southerly areas; i.e., Mt. Lemmon and Sierra Blanca. Since Tucson is considerably removed from other facilities within the state, residents from that city appear to be willing to travel beyond the border of the state to facilities which offer a more reliable snowfall and greater diversity. The mean distance traveled per weekend journey from Tucson was the highest in the state—421 miles.

In terms of socio-economic make-up, students comprise the greatest number of this group; however, the white collar worker is also heavily represented (Table VI). Correspondingly, the former group totals eight, the latter
Fig. 4. Tucson Weekend Trips
seven. Average incomes are slightly higher than those of the day-tripper, up approximately $600 to $13,794. As far as experience is concerned, the weekend skier had previously been active in the sport of skiing for about seven years.

The vacation trip exchange reflects greater distance although in terms of facilities visited, vacationers actually visited fewer areas. Skiers traveled an average of 735 miles and, with the exception of one trip, bypassed Arizona facilities entirely (Fig. 5). Operationally, Tucson vacationers were once again primarily students who were members of families whose income averaged $13,833. Experience-wise, the Tucson vacationer compared similarly to the day-tripper of that community, the average number of years of active participation totalling about four years (Table VI).

**Flagstaff Extended Trips**

While Flagstaff skiers for the most part utilized the facilities of the Arizona Snow Bowl on daily trips, over one-half of the residents took an extended trip during the 1970-1971 season to add a touch of variety to their skiing. Thirteen of twenty-five respondents took weekend journeys to other areas, while nine of twenty-five took a vacation trip during the year. Because of its
TO WASHINGTON
LAKE TAHOE AREA
CENTRAL CALIFORNIA
BRIANHEAD
SLC AREA
CENTRAL COLORADO AREA
LA AREA

SKU FACILITY SITE
BLACK INSERT AREA (SEE FIGURE 1.)
1 3 5 10
SKU TRIPS

TUCSON VACATION TRIPS

Fig. 5. Tucson Vacation Trips
northern location, Flagstaff residents were in closer proximity to most ski areas than the residents of Phoenix or Tucson. The average distance traveled by Flagstaff residents on extended trips was less than distances traveled by skiers from the southerly concentrations, except for weekend trips where Phoenix area skiers traveled an average of 292 miles as compared to 395 miles for the Flagstaff weekender. Examination of Fig. 6 reveals that weekend exchanges include movement to other areas within the state. The average length of vacation journeys originating in Flagstaff was 535 miles; all vacation trips were to out-of-state facilities (Fig. 7).

The weekend skiers from Flagstaff, when compared with the other two concentrations of the skiers within the state, had the greatest experience in skiing with an average of eight years of active participation. Corresponding figures for daily and vacation-type trips were approximately five years in both categories. Mean annual income was the greatest for daily visitors, being $17,190, and lowest for weekend skiers—$16,285. Vacation skiers from Flagstaff had a family income of $16,851 yearly. On all three trip types, the majority of the skiers were students (Table VI).
Fig. 6. Flagstaff Weekend Trips
Fig. 7. Flagstaff Vacation Trips
Theoretical Visitation Rates

In Skiing Trends and Opportunities in the Western United States, the U. S. Department of Commerce (1967) suggests that the larger facilities in that portion of the country tend to attract a greater number of skiers than do the smaller facilities. According to the study, differences in attendance are related to variations in the physical size of the facilities; larger areas generate a greater "attractive appeal" than do smaller ones. As is evident in Table III, the facilities visited by Arizona skiers during the 1970-1971 ski season varied considerably in physical size as measured in terms of annual vertical transport feet capacities. The question arises as to just how well the attendance rates from each center of population correspond to changes in distance and site attractiveness among the areas visited.

To assist in the answering of this question, the utility probability model described in the previous chapter is employed. Included in the formulation of the model is the statistical equation:

\[ r^2 = 1 - \frac{\sum_{k=1}^{z}(Y_{ik} - \hat{Y}_{ik})^2}{\sum_{k=1}^{z}(Y_{ik} - \bar{Y}_{ik})^2} \]
where \( r^2 \) = Coefficient of determination or the proportion of the total variability "statistically explained" by the model.

\[ Y_{ik} = \text{Actual number of trips made to the k}^{\text{th}} \text{ site from the i}^{\text{th}} \text{ origin.} \]

\[ \bar{Y}_{ik} = \text{Average number of trips to the k}^{\text{th}} \text{ site from the i}^{\text{th}} \text{ origin. (Total trips of the i}^{\text{th}} \text{ origin/total sites visited by the i}^{\text{th}} \text{ origin.)} \]

\[ \hat{Y}_{ik} = \text{Predicted number of trips to the k}^{\text{th}} \text{ site from the i}^{\text{th}} \text{ origin.} \]

This equation provides a means of measuring how effectively the model can predict the visitation rates at the alternate sites. As the projected attendance figures and actual attendance figures from a given origin approach equality, the coefficient of determination \((r^2)\) approaches 1.0. The \( r^2 \) value represents that proportion of variation between the actual and projected attendance rates which is "explained" by the model.

The probability model was employed to project attendance figures for each of the three areas within the state where concentrations of skiers resided. The relationship between projected and observed attendance was low for all three centers. Only the Phoenix model provided results worth interpreting.

The low predictive ability of the model might be attributed to several causes. For example, there is the possibility that the variables selected to represent distance or site attractiveness are either misappropriated
because of faulty information or even more basically, the variables may not provide a good measure or proxy value for site attractiveness. Also, it is quite possible that factors other than distance and physical site quality significantly affect the spatial exchange of winter sports enthusiasts.

The model, however, provides a means of comparison between the theoretical exchange based on distance and site attractiveness factors and actual interaction. For example, a comparison of actual and projected visitations for the center of Phoenix, \( r^2 = 0.51 \), reveals certain areas whose projected attendance greatly exceeds or falls short of the actual attendance (Table IX). Two areas within the state that are heavily overpredicted are the Mt. Lemmon and Williams ski facilities. One possible explanation as to why Phoenix area skiers tend to ignore these areas is their lack of glamour. Neither area provides much in the way of variety; the number of different runs one can ski is limited—only three trails are available at each site. Second, neither area has an uphill chair lift. A chair, besides providing a means of making more slopes available, is symbolic of a good ski facility (excellent areas are generally associated with even more sophisticated devices, such as the gondola and tram). Third, neither area is known for its accommodations or apres-ski
### TABLE IX
EXTENDED TRIPS FROM PHOENIX

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of Visits</th>
<th>Projected Number of Visits</th>
<th>Distance in Miles</th>
<th>Annual VTF (10^5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snow Bowl</td>
<td>74</td>
<td>70.12</td>
<td>160</td>
<td>39,120</td>
</tr>
<tr>
<td>Sunrise</td>
<td>27</td>
<td>12.88</td>
<td>220</td>
<td>23,660</td>
</tr>
<tr>
<td>Mt. Lemmon</td>
<td>1</td>
<td>22.82</td>
<td>140</td>
<td>6,300</td>
</tr>
<tr>
<td>Williams</td>
<td>1</td>
<td>11.66</td>
<td>170</td>
<td>6,930</td>
</tr>
<tr>
<td>Utah</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alta</td>
<td>6</td>
<td>1.97</td>
<td>635</td>
<td>291,060</td>
</tr>
<tr>
<td>Brianhead</td>
<td>4</td>
<td>10.69</td>
<td>300</td>
<td>73,780</td>
</tr>
<tr>
<td>Park City</td>
<td>6</td>
<td>2.11</td>
<td>635</td>
<td>362,880</td>
</tr>
<tr>
<td>Brighton</td>
<td>2</td>
<td>.87</td>
<td>635</td>
<td>116,655</td>
</tr>
<tr>
<td>Solitude</td>
<td>3</td>
<td>.77</td>
<td>635</td>
<td>101,850</td>
</tr>
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<td>New Mexico</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Taos</td>
<td>2</td>
<td>1.32</td>
<td>550</td>
<td>99,960</td>
</tr>
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<td>Colorado</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspen</td>
<td>10</td>
<td>18.28</td>
<td>750</td>
<td>7,094,320</td>
</tr>
<tr>
<td>Vail</td>
<td>4</td>
<td>5.45</td>
<td>720</td>
<td>1,550,465</td>
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<tr>
<td>Purgatory</td>
<td>44</td>
<td>1.64</td>
<td>485</td>
<td>73,500</td>
</tr>
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<td>Loveland</td>
<td>3</td>
<td>1.74</td>
<td>720</td>
<td>436,800</td>
</tr>
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<td>California</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squaw Valley</td>
<td>2</td>
<td>19.26</td>
<td>730</td>
<td>6,690,600</td>
</tr>
<tr>
<td>Mammoth</td>
<td>2</td>
<td>4.42</td>
<td>650</td>
<td>787,500</td>
</tr>
<tr>
<td>Heavenly</td>
<td>3</td>
<td>8.08</td>
<td>730</td>
<td>2,723,700</td>
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<tr>
<td>Idaho</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sun Valley</td>
<td>2</td>
<td>1.12</td>
<td>890</td>
<td>667,880</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>196.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Coefficient of Determination ($r^2$) = 0.51
entertainment. Most skiers, if they traveled overnight, like to spend their non-skiing hours in locations which cater to ski enthusiasts. Skiers tend to migrate to those locations which provide a more diverse physical plant and afford the skier an added extra in the form of amenities.

While theoretical attendance at both Williams and Mt. Lemmon are severely overpredicted, projected attendance figures for the Purgatory Ski Area are considerably underpredicted. The area attracted nearly two-thirds as many skiers as the Arizona Snow Bowl despite the fact that the facility is only twice as large as the Flagstaff area and three times further in distance. Several factors account for the popularity of this Colorado facility among Arizona skiers. First, the area has more reliable snow cover than the Arizona facilities where skiing tends to be marginal due to infrequent snowfall or slope orientation; i.e., the slopes at the Arizona Snow Bowl are south-facing causing the snow cover to quickly melt. Second, the community of Durango is economically geared to accommodate the skiers. The community has several overnight accommodations which cater to skiers' after-ski comfort by furnishing sauna and whirlpool treatments. While apres-ski is not as attractive as at Aspen or Squaw Valley, there are several establishments which provide for the entertainment desires of the skiers. Third, the city of Durango
actively promotes skiing by advertisement and inducements. Purgatory and Durango are well known in the Southwest for their "ski package" which includes ski lessons, lift tickets and lodging at considerable financial savings. And finally, the area is situated in Colorado, known as "Ski Country, USA," an intrinsic value which adds prestige to a journey taken to Purgatory or to any area within the state. Of the total number of extended journeys from Arizona, 35 percent of the trips are to Colorado.

Other Considerations

Besides relating attendance to the physical capacity of an area, the U. S. Department of Commerce (1967) also suggested that there is a difference in the socio-economic make-up of those people who participated in the different trip types. To assess the validity of this statement and to test the assertion that variations in trip types are related to variations in the experiential background of the individual skier, Chi-Square tests were performed using 7 x 7 contingency tables so constructed as to compare trip types, either singularly or in combination, against: (1) annual family income (Table X), and (2) the number of years each skier had actively participated in the spot of skiing (Table XI). To establish the necessary theoretical frequencies for the basis computation, the following null hypotheses were tested: (1) variations in
### TABLE X

**CHI-SQUARE TABLE OF ANNUAL FAMILY INCOME AND TRIP TYPES**

<table>
<thead>
<tr>
<th>Type of Trip</th>
<th>0000-5999</th>
<th>6000-8999</th>
<th>9000-11999</th>
<th>12000-14999</th>
<th>15000-17999</th>
<th>18000-20999</th>
<th>Over 25000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>2.00</td>
<td>3.00</td>
<td>2.00</td>
<td>4.00</td>
<td>5.00</td>
<td>4.00</td>
<td>7.00</td>
</tr>
<tr>
<td></td>
<td>2.57</td>
<td>3.43</td>
<td>2.36</td>
<td>3.21</td>
<td>3.21</td>
<td>3.64</td>
<td>8.57</td>
</tr>
<tr>
<td>Weekend</td>
<td>0.00</td>
<td>3.00</td>
<td>6.00</td>
<td>2.00</td>
<td>4.00</td>
<td>3.00</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td>2.95</td>
<td>2.79</td>
<td>1.93</td>
<td>2.62</td>
<td>2.62</td>
<td>2.97</td>
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<td>1.00</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
<td>7.00</td>
</tr>
<tr>
<td></td>
<td>1.24</td>
<td>1.66</td>
<td>1.13</td>
<td>1.55</td>
<td>1.55</td>
<td>1.75</td>
<td>4.13</td>
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Calculated $\chi^2 = 49.16$

Tabular $\chi^2 .05 = 54.47$
### TABLE XI

**CHI-SQUARE TABLE OF YEARS OF SKIING EXPERIENCE AND TRIP TYPES**

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Calculated $x^2 = 52.71$

Tabular $x^2 .05 = 54.47$
trip types are not related to variation in annual family income, and (2) variations in trip types are not related to variations in the experiential background of the skier.

The computation of the Chi-Square for both sets of data reveal insufficient proof of any association between the variables when tested at the .05 significance level with 36 degrees of freedom. The null hypotheses are acceptable—there does not appear to be variation between trip types and either annual family income or experiential background.
CHAPTER V

SUMMARY AND CONCLUSIONS

Between November 1971 and March 1972, a sample group of 138 Arizona skiers were asked through verbal interviews to describe their skiing activity for the preceding season, 1970-1971. Interviews administered by the author at various ski facilities and retail sporting goods stores about the state, sought three primary sets of data: (1) information on the individual's ski history, (2) information on the individual's socio-economic background, and (3) information on travel behavior for the 1970-1971 season. A compilation of the questionnaires revealed vast individual diversity in all three sets of data; i.e., previous experience varied from those who were just gaining confidence enough to negotiate the bunny slopes to a retired ski instructor; annual family income varied from under $3,000 to over $40,000; and trips ranged in distance from under twenty miles to trans-oceanic travel to the French Alps. However, the purpose of this study was not to examine individual behavior but to describe and analyze some composite travel patterns and the socio-economic and experiential backgrounds of skiers residing within the
Several general statements covering the Arizona skiers can be made:

1. The movement of Arizona skiers is governed by the availability of leisure time and travel requirements. Daily exchange tend to be within the confines of the state. Day-trippers tend to visit the facility closest to their residence. An exception to this generalization is Phoenix where skiers ignored the Mt. Lemmon facility in favor of the more distant Arizona Snow Bowl. The latter offers the Phoenix area skier a larger, more varied facility than does the Mt. Lemmon area.

   The friction of distance appears to be somewhat reduced by an increase of available leisure time. While daily trips were almost exclusively confined to ski areas within the state, the extended trips were characterized by greater geographic diversity. In 56 percent of the total weekend journeys, state ski facilities were utilized. This figure is reduced even further on vacation exchanges. Of the total number of vacation trips, only 8 percent were to facilities within Arizona.

2. Since the inconveniences operative in daily trips were less imposing with increased leisure time, the question was asked: "did attendance rates over space reflect improvement in the quality of the area?" In an attempt to answer this question a probability model which
incorporated into its formulation the factors of site attractiveness and distance was used to compare theoretical attendance with actual attendance. Overall, the ability of the model to predict attendance from the three concentrations of potential skiers was not impressive although the model was moderately successful when applied to Phoenix—coefficients of determination \( (r^2) \) for Tucson, Flagstaff, Phoenix were 0.03, 0.02 and 0.5 respectively. It would appear that distance and site attractiveness factors alone do not statistically account for a large portion of the movement of Arizona skiers. However, this statement should be qualified since it is quite possible that the values used to measure distance and/or site attractiveness were not equally weighed. This is particularly true with regard to the site attractiveness variable since a good share of these data were assembled from facility operators and some partisan bias may have been included in the data.

3. Variations in size of the ski areas, nevertheless, appears to be an important element in the skiers' selection. On extended trips, attendance at the smaller areas within Arizona, Mt. Lemmon and Williams, is noticeably below predicted values; neither facility affords the skier much slope variety. Variations in slopes appear to strongly influence the skier's selection of an area
and his overall movement to other facilities. Visits to different areas provide a new challenge, a chance to test ability against different terrain conditions. Of the total of 139 Arizonians who were interviewed, over 55 percent of the skiers visited more than one area. One avid ski enthusiast visited eleven different facilities during the 1970-1971 season.

4. Another important factor which appears to contribute to the attractiveness of an area, in addition to the physical plant of a facility, is the social atmosphere provided by a ski area and surrounding communities. The skier has a preconceived notion of what a "ski town" should include; e.g., a rustic mining-camp facade, quaint restaurants and lodges, and good accommodations. If these conditions are met, attendance at such an area is a little more rewarding and post-trip recollections may play a role in the future selection of ski facilities.

5. The type of trip in which skiers engage does not appear to reflect basic differences in mean annual income or in the number of years a skier has participated in skiing. These conclusions were suggested by Chi-Square ($x^2$) analysis which was based upon the null hypothesis that there is no relationship existing between (1) income and trip types, and (2) experience and trip types. However, those individuals who engaged in extended trips had
a mean annual income which was nearly $700 higher than the $15,912 average of daily skiers. Similarly, the number of years of experience was higher for those Arizona residents who took extended trips. Daily skiers averaged slightly more than five years of experience, while Arizona residents who took extended-type trips average nearly six and one-half year experience. Some differences do exist but they are not significant in a statistical sense.

The travel behavior of Arizona skiers appears to be the manifestation of the carefully weighed decisions of many individuals. Many of the variables which affect the skier's decision are of an intrinsic nature. To fully understand the spatial exchange of the Arizona skier is certainly an immense task. Additional research is necessary before the complex interrelationship of all variables operative in the travel behavior of the Arizona skier can be fully explained.
APPENDIX

ARIZONA SKIER QUESTIONNAIRE

Hello, I am __________ from The University of Arizona. We are conducting a survey of Arizona skiers in order to gain a better understanding of their spatial travel behavior.

Would you have a few minutes to answer some questions:

First of all, a few qualifying questions.

During the 1970-71 ski season, did you actively engage in the sport of skiing? Secondly, did you reside in Arizona? (If yes to both questions, continue; if no, terminate.) Where was your residence last ski season?____________________

1. How many years have you actively participated in skiing?__________

2. What class of skier do you consider yourself to be, an
   Expert
   Advanced
   Intermediate
   Novice
   Other _______ skier?

3. Approximately how many days did you ski last season?_____

4. At how many different areas did you ski?_____

67
5. During the 1970-71 ski season, did you take any extended "vacation" ski trips during which you spent more than four nights away from your residence? Yes No (If No, go to question #12).

6. How many trips of this type did you take last seasons?____

7. While on your (first, second, third, fourth) vacation ski trip, where did you ski?

   1st_________________________________________
   2nd_________________________________________
   3rd_________________________________________
   4th_________________________________________

8. Why did you select (the area from above) as an area at which to spend your ski vacation?

   1st area________________; ________________
   2nd area________________; ________________
   3rd area________________; ________________
   4th area________________; ________________

9. While in transit between or while at (the area from above), was there anything that detracted from your enjoyment?

   1st area________________; ________________
   2nd area________________; ________________
   3rd area________________; ________________
   4th area________________; ________________
10. What mode of transportation was utilized for transit between your residence and the ski area?

1st area_________ 2nd area_________

3rd area_________ 4th area_________

11. While on a "vacation" ski trip, what is the maximum distance you would drive to ski?

_______________________________________

12. During the last ski season, did you take any "weekend" ski trips during which you spent at least one but not more than three nights away from your residence?

Yes No (If No, go to question #19).

13. How many trips of this type did you take last season?

_______________________________________

14. While on your (first, second, third, fourth) "weekend" ski trip, where did you ski?

1st_____________________________________

2nd_____________________________________

3rd_____________________________________

4th_____________________________________

15. Why did you select (the area from above) as an area at which to spend your ski weekend?

1st area_________; _____________________

2nd area_________; _____________________
16. While in transit between or while at (the area from above), was there anything that detracted from your enjoyment?

17. What mode of transportation was utilized for transit between your residence and (area from above)?

18. While on a ski "weekend," what is the maximum one way distance you would drive to ski?

At this point, if the interviewee has gone on any "vacation" or "weekend" ski trips, show him the accompanying map and ask him to point out the routes that he used in transit between his residence and the areas at which he skied.
Fig. 8. Map of Western Ski Facilities Used with Questionnaire
19. During the last ski season, did you undertake any "daily" ski trips? Yes No (If No, go to question #26).

20. How many trips of this type did you take last season?__________

21. At what facilities did you ski during daily trips?

1)____________________________________________
2)____________________________________________
3)____________________________________________
4)____________________________________________

22. Why did you select (the facility from above) as a place to ski?

1)_________________; ________________
2)_________________; ________________
3)_________________; ________________
4)_________________; ________________

23. While in transit between or while at (the facility from above) was there anything that detracted from your enjoyment?

1)_________________; ________________
2)_________________; ________________
3)_________________; ________________
4)_________________; ________________
24. Was a motor vehicle utilized for transit between your residence and the ski facilities you have just mentioned?
   Yes  No  Not Always

25. While on a "daily" ski trip, what is the maximum distance you would drive to ski?
    ________________

26. Do you feel the facilities in Arizona are:
   Excellent  Good  Fair  Poor?

27. What could be done to improve Arizona's ski facilities?
   a)______________________________
   b)______________________________
   c)______________________________

28. Do, or did either of your parents ski?
    (Circle one)
    One  Both  Neither

29. Are you married  single  divorced widowed?  (Circle one).

30. If married, does your spouse ski?  Yes  No  (Circle one).

31. How large is your family (include yourself)?
    _______________(number)

32. How many members of your family ski?
    _______________(number)
33. What is your approximate family income? (Circle one)
   a) Under $3000  
   b) $3000-$5999  
   c) $6000-$8999  
   d) $9000-$11,999  
   e) $12,000-$14,999  
   f) $15,000-$17,999  
   g) $18,000-$20,999  
   h) Over $21,000

34. Your sex? Male Female (Circle one)

35. What is your age? (Circle one)
   a) Under 18  
   b) 18-22  
   c) 23-29  
   d) 30-40  
   e) Over 40

36. What is your educational background? (Circle highest level)
   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
   (Grade School) (High School) (College)
   17 18 19 20

37. What is the highest degree you have earned?

38. What is your occupation?

Thank you for your assistance - Good Skiing!
SELECTED BIBLIOGRAPHY


