Technical Bulletin 218

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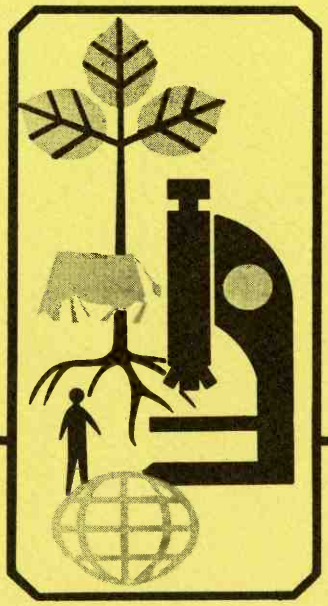

Agricultural Experiment Station • The University of Arizona

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Outdoor Recreation in the Salt-Verde Basin of Central Arizona: Demand and Value

Werner J. Sublette*
William E. Martin**

**Former Research Associate, Department of Agricultural Economics, the University of Arizona. Currently Assistant Professor of Economics, Northeast Missouri State University, Kirksville, Missouri.*

***Professor of Agricultural Economics and Agricultural Economist in the Agricultural Experiment Station, The University of Arizona.*

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CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

Summary

The intent of this study has been to investigate the demand for and value of outdoor recreation in the Salt-Verde Basin of Arizona with the purpose of aiding the U.S. Forest Service in efforts to efficiently administer the Salt-Verde Basin as outlined in the Multiple Use Sustained Yield Act of 1960.

When several products can be produced from a single resource base such as the Salt-Verde Basin, the economic problem becomes one of maximizing the value of product-output relative to a given cost. Since demand functions for most other products except outdoor recreation have been either directly or indirectly estimated, it was the task of this research to develop demand functions and to determine the value of the resource in recreational use.

It was not feasible to study each of the recreational sites within the eight million acre Basin. Therefore, the concept of the "representative site" was adopted. Each representative site was viewed as a stand-in for similar sites within the Basin.

The number of sites selected for study was constrained by the available time of the researcher and the size of the Forest Service grant of funds. As a result, all types of sites may not have been represented. However, an effort was made to select a variety of sites with respect to vegetative type, recreational activities, and location relative to major population centers. The five sites selected for study were Brushy Basin-Four Peaks in the Tonto National Forest, Horsethief Basin in the Prescott National Forest, Knoll Lake in the Coconino National Forest, Black Canyon Lake in the Sitgreaves National Forest, and Luna Lake in the Apache National Forest.

In order to generate the required data, a mail survey of households that visited the selected representative sites in the Basin was conducted. Over 5,000 questionnaries were mailed throughout the 1972 outdoor recreation season. Overall response to the questionnaires was 51 percent.

As a measure of gross economic activity, gross variable household expenditures incurred to visit the areas were compiled from the sample data. The largest portion of expenditures were incurred for transportation, ranging from 37 percent at Luna Lake to 53 percent at Brushy Basin-Four Peaks. The majority of the households visiting the selected sites resided in the Phoenix metropolitan area. The exception was for Luna Lake, where over 33 percent of the site's users originated from out-of-state, mostly from New Mexico and Texas. Households residing in the Phoenix metropolitan area incurred a low of 23 percent of all expenditures at Luna Lake and a high of 96 percent of all expenditures at Horsethief Basin. Households visiting sites that are relatively close to the point of origin in terms of travel time, take more trips and stay fewer days at a site than households visiting sites that are located a long distance from a household's place of residence.

In order to accomplish the basic objective of determining values for the several representative sites, it was assumed that the user costs associated with a recreation activity provide a valid substitute for the price of a recreational experience. Traditional demand theory can be applied to outdoor recreation by defining demand as the amount of recreational activity that will be taken by households at various levels of user expenditures. This demand function can be expressed by a statistical demand estimate which can be used in deriving values for the recreation resource. This is the standard Clawson-Hotelling approach to estimating recreation demand.

Modifications of method introduced by Brown and Nawas (1971, 1972) to the Clawson-Hotelling procedure were employed as well as additional modifications and alterations made as discussed in Appendix A. Individual observations were used to derive individual household demand functions defining the number of days a household took at a specific site per year and the associated variable costs. These individual demand functions were then aggregated and expanded by the proper blow-up factor to arrive at a demand function for the specific representative site. The benefit of basing the analysis on individuals' responses to costs, rather than on group means, is that the specification of the demand equation may be improved and greater confidence may be held in the estimates of value. The resulting statistical demand estimates were used to generate resource values by both the consumer surplus and non-discriminating monopolist methods.

For one area, Brushy Basin-Four Peaks, an alternate approach to estimating a statistical demand curve was utilized since the data did not give significant results using the individual observation modification of the Clawson-Hotelling procedure. Instead, the "direct"

technique was employed. This method attempts to estimate a demand function by asking households how large an entry fee they would be willing to incur for the use of the recreation site rather than be excluded (Knetsch and Davis, 1966).

The resultant net economic value estimates chosen as "best" estimates for each of the five representative sites, and the variable expenditures incurred by recreationists visiting these sites in 1972 are presented in Table 1. Luna Lake, a highly developed site with easy access, water-based recreation, and the farthest away from the Phoenix metropolitan area is shown to have the highest net values as well as inducing the greatest expenditures incurred by households. Brushy Basin-Four Peaks and Horsethief Basin, the two sites that were located nearest the Phoenix metropolitan area, had the most difficult access, and were virtually without any water-based recreation, had the lowest values and the smallest expenditures incurred by households.

It is apparent that higher net values and larger expenditures are associated with sites that have water-based recreation, considerable development at the sites, and fairly easy access.

TABLE 1

Nondiscriminating Monopolist and Consumer Surplus Values Compared to Total Variable Expenditures Incurred by Households at the Selected Sites, 1972

Site	Variable Expenditures ($)	Nondiscriminating Monopolist Value[1] ($)	Consumer Surplus Value[2] ($)
Luna Lake	520,711	483,327	1,117,539
Black Canyon Lake	191,871	270,579	772,413
Knoll Lake	231,908	338,240	861,750
Horsethief Basin	112,993	64,719	125,609
Brushy Basin—Four Peaks	60,108	4,200	12,200

[1]The maximum "market value" of the site for one year.
[2]The total "net benefit" to the public for 1972.

Table 1 also compares variable expenditures incurred by recreationists with the net values estimated for the resource using the individual observation technique. The nondiscriminating monopolist values tend to be smaller than the variable expenditures for Brushy Basin-Four Peaks and Horsethief Basin, where travel and other expenses are relatively minor. For sites that are more distant from most households' places of residence, and therefore involve greater travel costs, and for sites having water-based recreation available, the monopolistic values tended to be greater than the variable expenditures.

Consumer surplus values were larger than the variable expenditures for all sites except Brushy Basin-Four Peaks where the individual observation modification to the basic Clawson-Hotelling approach to estimating a site's statistical demand curve was not employed. The values shown for Brushy Basin-Four Peaks are considered to be underestimates of the true values.

Demand functions and estimated values were determined for only a few representative sites in the Salt-Verde Basin. A value for the entire Basin for recreation use was estimated by using the values determined for the selected representative sites as a basis for valuing the other sites in the Basin. All developed sites managed by the U.S. Forest Service within the Salt-Verde Basin were classified according to the amount of development at a site, the activities available, visitor use, and distance away from the Phoenix metropolitan area. These sites were then matched as closely as was possible with the representative sites and the values assigned to them were totaled.

The nondiscriminating monopolist value estimated in the manner described above for the sites in the entire Salt-Verde Basin is $36,376,487. The consumer surplus value is estimated at $78,438,193. These aggregate values do not include most of the dispersed recreation areas nor do they include the value of the Basin for hunting.

CHAPTER I
Introduction

Much of the outdoor recreation in Arizona occurs on publicly owned land and water resources. Because recreation on public lands has no conventional market price, there is a problem in quantifying the benefits that accrue from the recreational resource. In the absence of market pricing to guide and direct the allocation of resources, it is difficult to allocate efficiently these natural resources among their alternative uses. Each alternative use has its own associated resource value. If decisions relative to resource allocation are not to be totally arbitrary, resource values should be estimated for all types of uses as inputs to the decision process.

Until recently, many planners and administrators have been unwilling to include measures of the monetary value of outdoor recreation in the management decisions that affect resource use. They felt that recreation value defies any type of measurement and is, therefore, priceless. However, the issue when dealing with outdoor recreation is not one of an absence of monetary values but rather one of measurement. The mere nonexistence of ready made market prices does not preclude the fact that values for this type of resource do exist.

Economic values are measured by what people are willing to sacrifice in order to obtain a good or a service. Therefore, a relevant measure of an outdoor recreational value is simply the willingness on the part of a consumer to give up all or part of his income and/or time, that is to incur a cost, in order to enjoy an outdoor recreation experience. This measure of value is conceptually the same as that for other economic goods. The method of valuing an outdoor recreation experience based on the notion that the value of the experience is reflected in the cost of consuming that experience is consistent with the methods used for valuing resources associated with market-priced goods, except that outdoor recreation goods lack a formal market determined price.

Consumers of any economic good or service must receive satisfaction (utility) that is at least equal to the cost that they are willing to incur, otherwise they would not be acting rationally in incurring this cost. With a market-priced commodity, the price that is paid in the market, along with the time involved in purchasing that product (other factors such as income being constant), regulates the amount that is consumed of that product. Likewise, the money and distance (time) costs of a recreational activity will determine the amount of participation of individual recreators, and the satisfaction (utility) received must be at least equal to the cost the people are willing to incur.

Research Objective

The objective of this study is to investigate the demand for and the value of outdoor recreation in the Salt-Verde Basin of Arizona. This Basin constitutes eight million acres of land whose vegetation ranges from lower elevation shrubs to the higher elevation ponderosa pines, and therefore offers Arizonans a wide variety of outdoor recreation opportunities. The popularity of this Basin is not only due to the variety of outdoor recreation activities that are available, but also because of the Basin's proximity to two of Arizona's largest metropolitan centers, Phoenix and Tucson (Figure 1).

The U.S. Forest Service, with the passage of the Multiple Use Sustained Yield Act of 1960, was given the task of administering the National Forest Lands for purposes of producing outdoor recreation, range lands, timber, water and wildlife in combinations that best meet the needs of the American people. In order for the U.S. Forest Service to efficiently administer the Salt-Verde Basin as outlined in the Multiple Use Sustained Yield Act of 1960, it is essential that they know the values of the products that are produced by these Forest Lands.

Where such a multiple product situation exists on a given resource base, the economic problem becomes one of maximizing the value of product-output relative to a given cost. In economic terminology, the product-product relationship must be solved. (Heady, 1961). In doing so, the following must be accomplished: (1) the technical substitution relationships between products must be specified at all levels of output of each, (2) the relevant demand functions for each product must be specified, and (3) using information from 1 and 2 above, a solution must be obtained for the optimum combination of products to produce. Obviously, this optimum combination of products will change if the relative prices of any two products change.

The relevant technical transformation functions for products of the Salt-Verde Basin are being estimated by the Rocky Mountain Forest and Range Experiment Sta-

tion (O'Connell and Brown, 1972). Demand functions for most products except outdoor recreation have been either directly or indirectly estimated (O'Connell, 1972). It is, therefore, the task of this research to develop demand functions for outdoor recreation and to determine the value of the resource in recreational use.

The procedures used in this study attempt to measure individual willingness to pay for alternative quantities of an outdoor recreation activity at several representative outdoor recreation sites; that is, demand functions for the use of these representative sites are estimated. These functions are used to relate the willingness to pay for alternative quantities of an outdoor recreation activity to the estimated value of the site resource itself. While the demand functions and estimated values are for only a few representative sites, an attempt is made to set these estimated values within the framework of the recreational use of the entire Salt-Verde Basin.

To accomplish the aforementioned objectives, the general Clawson-Hotelling (1949, 1959) approach to outdoor recreation demand analysis is used in conjunction with appropriate statistical methods and conceptual modifications.

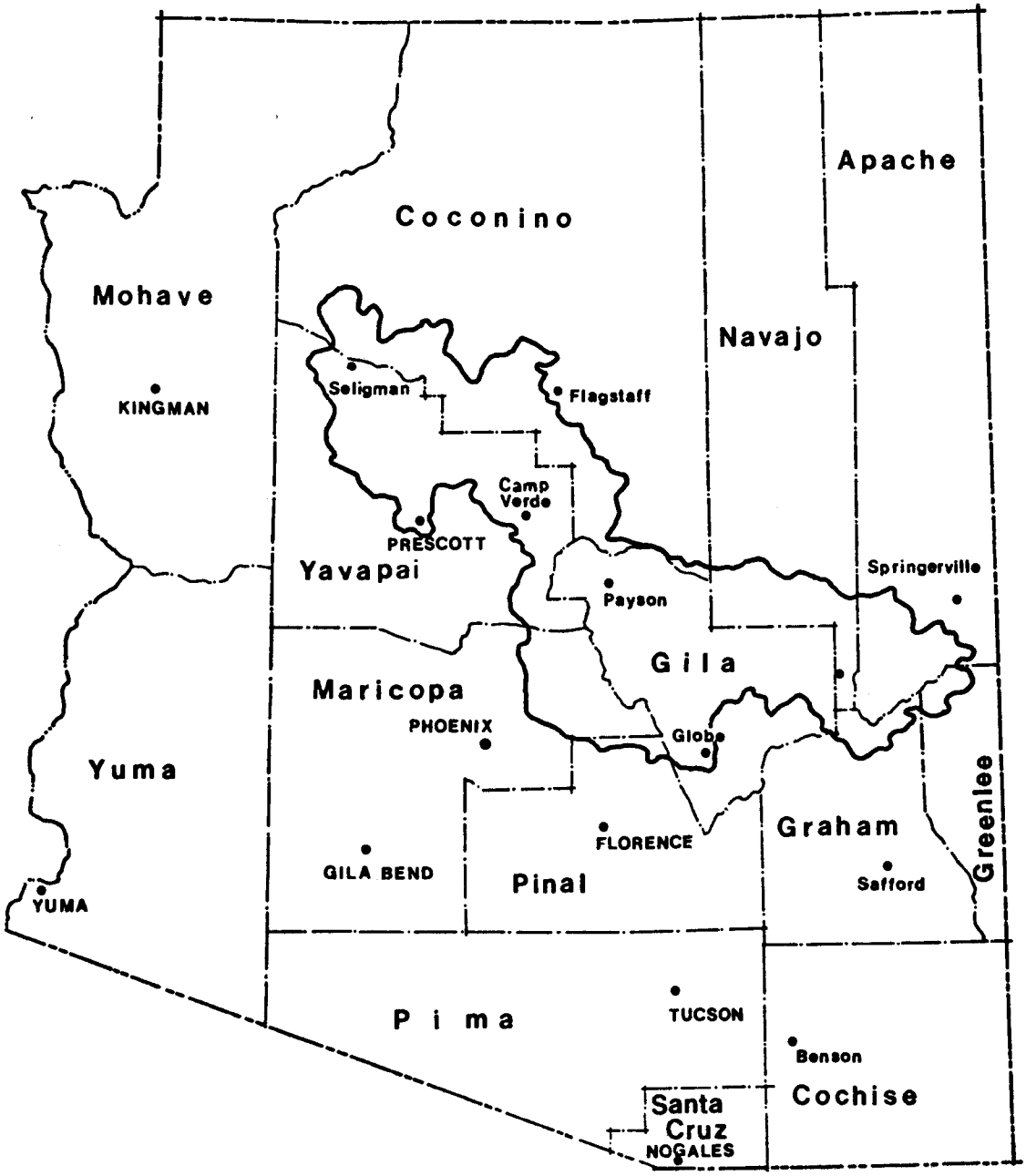

FIGURE 1

Map of Arizona with an Outline of the Study Area.

CHAPTER II

Applied Research in Recreation Demand and Value

Demand Estimation

The basic elements of the Clawson-Hotelling two-stage procedure for estimating the demand for recreation has been described in detail by Brown, Singh, and Castle (1964), Wennergren (1967a) and most recently, specifically for an Arizona application, by Martin, Gum and Smith (1974). Only the general elements of the procedure are reviewed here to aid interpretation of the results. Specific details of the process followed are covered in Appendix A.

The concept of the use of a recreation site is only one part of what Clawson refers to as the "whole recreation experience" (Clawson and Knetsch, 1966). According to Clawson, the whole recreation experience includes anticipation and preparation for the trip, travel to the site, the actual on-site experience, travel back from the site, and recollection of the experience. Clawson maintains that all five phases are present in every major outdoor recreation activity. Thus, when measuring the value of an outdoor recreation site, one must separate the value of the site from the value of the whole recreation experience. The separation involves a two-step procedure.

In the first step, the variable costs associated with the recreation experience are regressed against the number of visits per capita the recreationists took to that site from various distance zones. Clawson argued that the resulting statistical demand curve represents the demand for the total five-part recreation experience. Then, the demand curve for the recreation resource itself (i.e., the site) is derived from the statistical demand function by relating posited added costs (e.g., alternative levels of entrance fees) to the number of visits made to the site. It is the demand for the site itself, the natural resource and its attached man-made facilities, that is of basic interest.

The type of basic data needed under the Clawson approach in order to derive the demand for the whole recreation experience are listed in Table 2. In this example, the variable costs spent by each person from a particular zone in visiting the recreation site are assumed to be the same for every visitor from that zone. The number of visits is put on the basis of per 1,000 population from the zone of origin, in order to remove the differences in population from one zone to another. By plotting costs from column (3) against the corresponding number of visits per thousand population from column (5), a demand curve for the total recreation experience can be determined and is depicted in Figure 2.

The second step in the analysis is that of developing a demand curve for the resource site itself. This site demand curve is derived from the total demand curve for the recreation experience based on the assumption that the resource users would react to changes in costs at the site (e.g., an entry fee) in the same manner to which they react to changes in costs for the recreation experience as a whole. In developing the demand curve for the resource, the total projected number of visits is calculated at each posited increased interval of cost. The resulting demand curve is in terms of added costs and total quantities of visitation.

TABLE 2

Prices and Quantities for Statistical Demand for Recreation (Hypothetical)

Zone	Population of Zone	Cost from Zone to Recreation Area	Number of Visits	Visits per 1,000 population
1	1,000	$1.00	500	500
2	4,000	3.00	1,200	300
3	10,000	5.00	1,000	100
			2,700	

Source: Clawson and Knetsch [1966].

TABLE 3

Values for Total Quantity of Visits and Added Costs (Hypothetical)

	Number of Visits at Added Cost Per Unit					
Zone	0	$1.00	$2.00	$3.00	$4.00	$5.00
1	500	400	300	200	100	0
2	1,200	800	400	0	0	0
3	1,000	0	0	0	0	0
Total Visits	2,700	1,200	700	200	100	0
Total Revenue Generated	0	$1,200	$1,400	$600	$400	0

Source: Clawson and Knetsch [1966].

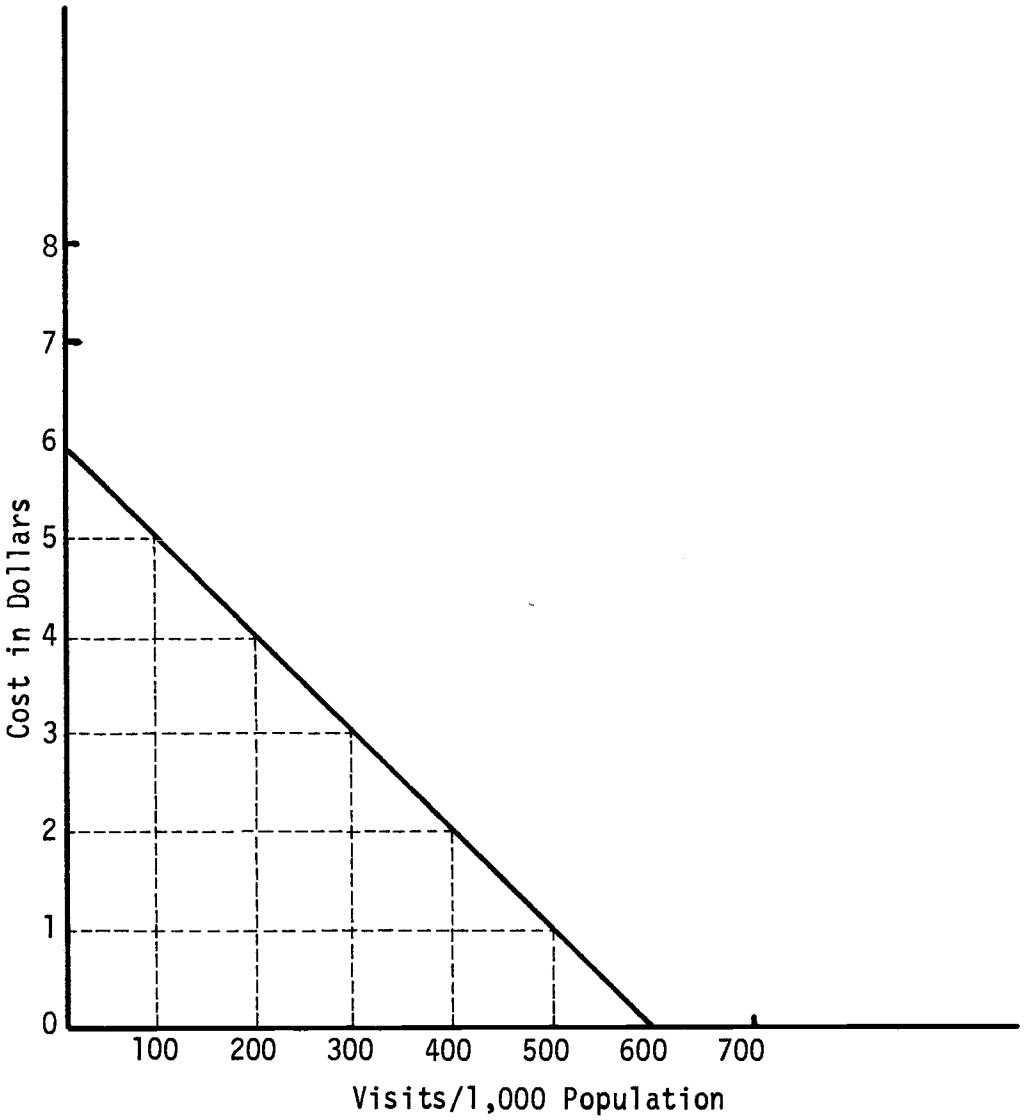

FIGURE 2

Demand Curve for the Total Recreation Experience (Hypothetical).

Source: Clawson and Knetsch(1966).

An example will clarify the notion of developing the demand curve for the resource. The total quantity of visits at the existing prices was 2,700 as shown in Table 2. By adding increments of one dollar to each original price, the corresponding quantity of visits can be determined as follows:

At the $1 added cost per visit from distance zone 1, the number of visits per 1,000 population is determined from Figure 2 to be 400. In essence, at a cost of $2 per visit, the number of visits per 1,000 from distance zone 1 is 400. This figure is then converted to total visits at the $1 added cost in the following manner:

$$\frac{400}{1{,}000} \times 1{,}000 = 400$$

That is, at the $1 added cost,

$$\frac{\text{visits}}{1{,}000 \text{ pop.}} \times \text{population of the distance zone} = \text{total visits}$$

This same process is repeated for each distance zone. The total visits for each distance zone at the $1 added cost per visit are summed to establish one point on the demand curve for the resource itself.

This procedure is repeated for different added costs to arrive at a schedule as shown in Table 3. The points of added cost and total visits as shown in Figure 3, are points on the demand curve for the resource itself. It is this demand curve for the resource that is used to evaluate the resource itself.

Value Estimation

The value of outdoor recreation concerns governments because one of their functions is to allocate funds and resources among competing uses. Recreational activities often assume the role of collective goods in that it is frequently unfeasible to collect a direct charge for their use and may, therefore, require public action. Especially in the West, most outdoor recreation opportunities are on public lands. As a result, federal agencies have had the management of outdoor recreation practically thrust upon them. Unless some type of value can be attached to the benefits of a proposed recreational project, and unless this value can be expressed in such a way that it can be compared with the benefits of other proposed proj-

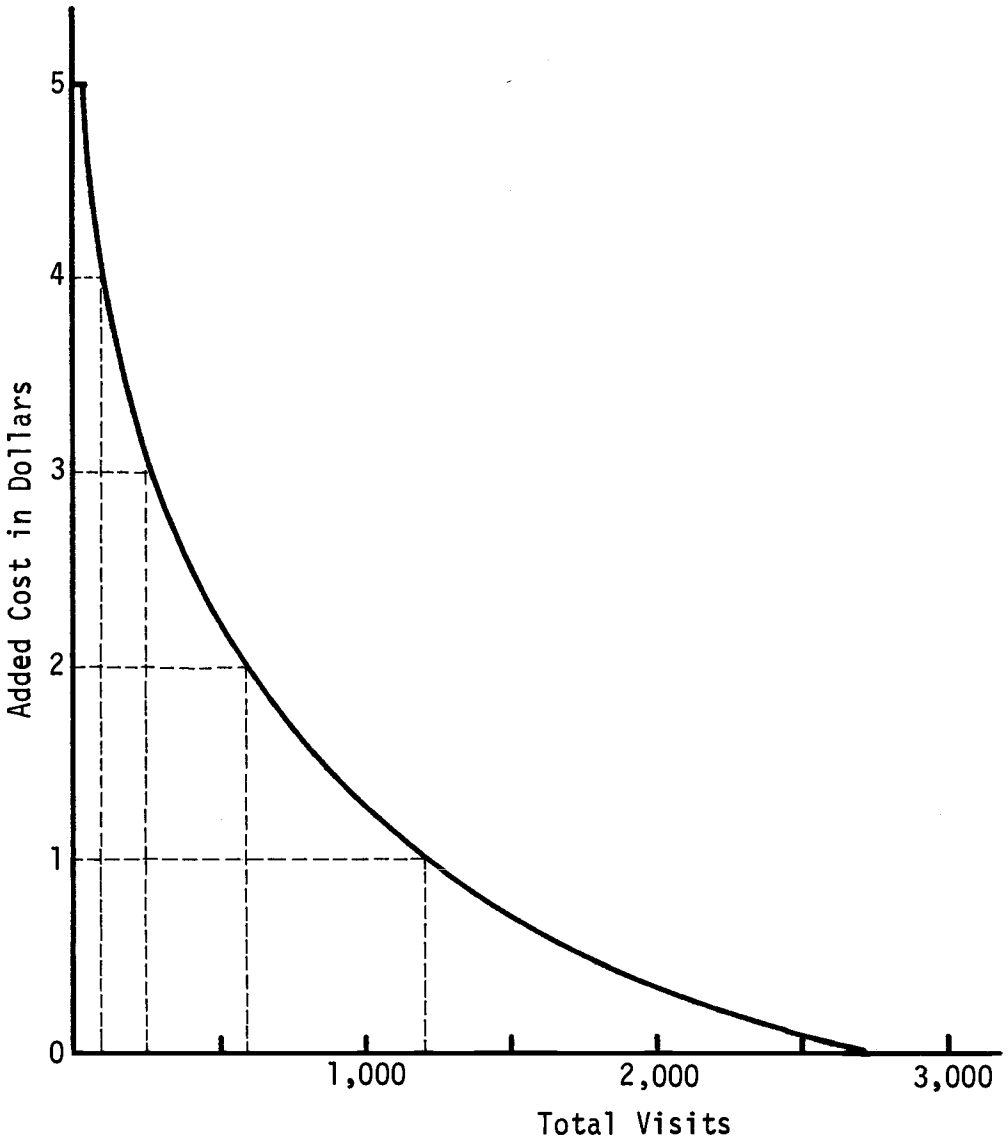

FIGURE 3

Demand Curve for the Resource (Hypothetical).

Source: Clawson and Knetsch (1966).

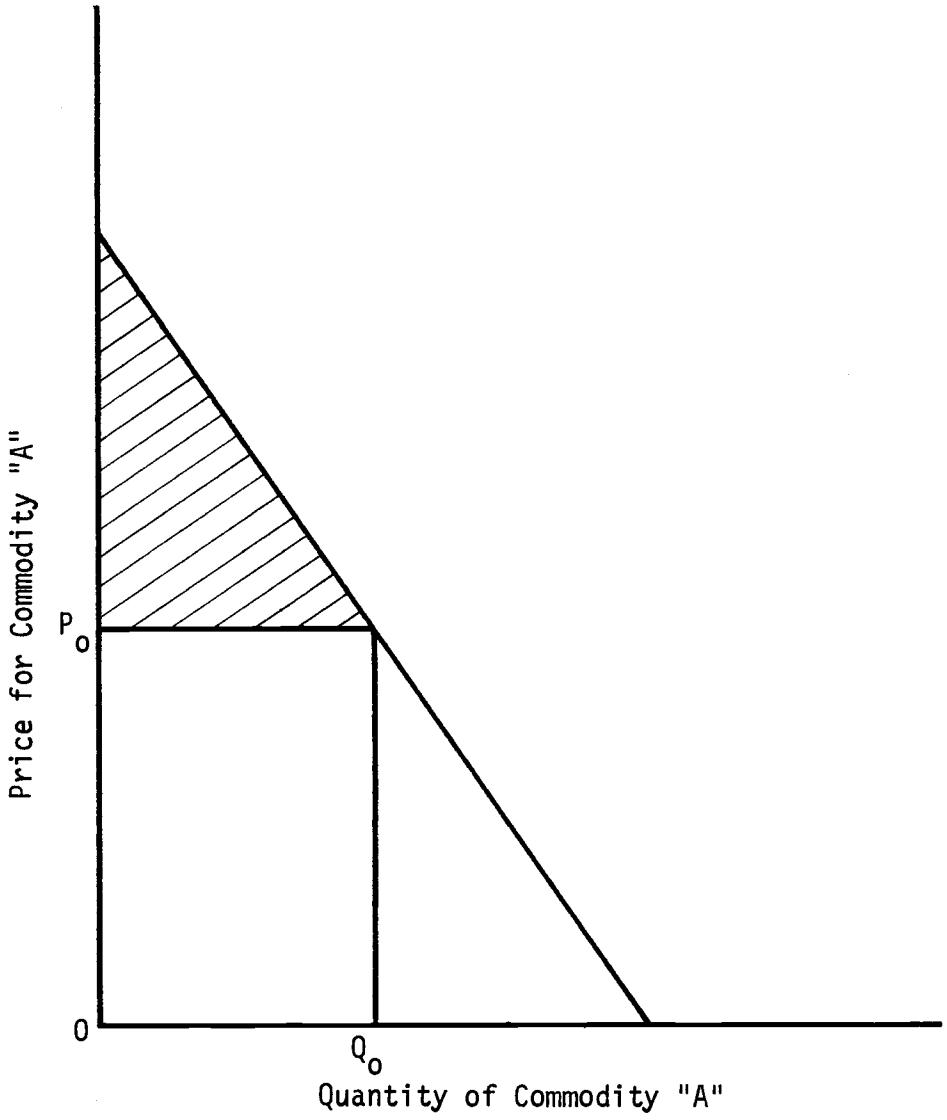

FIGURE 4

Relationship of Consumers' Surplus to Demand.

ects, it is not likely that an optimal amount of money and other resources will be expended on outdoor recreation (Trice and Wood, 1958).

In trying to value any good or service, one immediately thinks of the market price of that good or service. One must recognize, though, that the market price does not represent the total value that a good provides for an individual or for a society. Consequently, Beazley feels that the market demand value should not be used as the major criterion that governs the allocation of resources into outdoor recreation (Beazley, 1961, P. 647).

> Market demand values tend to be good indicators of a resource allocation where the great majority of the benefit received is individual in character and is fully recognized by that consumer with respect to both immediate and future effect . . . Great art, education, hospitals, roads and many other so-called 'community services' fall more or less into the same category as outdoor recreation, wherein many social values to the individual are involved, often having long term implications for the future of society.

For many years most people felt, as apparently did Beazley, that recreation was incapable of being measured because of the intangible benefits that were derived from it. However, Crutchfield (1962, p. 149) points out that this kind of reasoning "is to deny the rationale of our entire economic organization." One simply can't give up and refuse to value outdoor recreation.

There are currently two generally approved methods for estimating recreation resource values. The first is to approximate the consumer surplus implied by an estimated recreation demand function. The central idea behind consumer surplus is that the consumer has in his mind a price that he would be willing to pay rather than to go without a certain commodity. The price that the person is willing to pay is usually greater than the price he does pay. Since price is a measure of utility, the difference in price that the individual is willing to pay and the price that he does pay is a measure of surplus satisfaction. This price difference also represents the monetary savings to the individual at the given market price, and can be represented graphically by the shaded portion in Figure 4. Consumer surplus is the area under the demand curve that is above the price (P_0) at which the commodity is being sold.

Mathematically, consumer surplus can be determined by evaluating the integral under the demand curve up to the quantity (Q_0) that is being sold, and subtracting out the total cost (P_0Q_0) that is actually being paid.

Wennergren (1967b), in his deer hunting study, defines the second-stage demand curve as developed for Figure 3 as the quantitative estimate of the value of the marginal utility generated by the resource when recreationists equate the value of marginal utility with marginal cost. All the hunting visits except the marginal visit were worth more in terms of utility than their associated costs. Thus, the surplus satisfaction that was derived from all the visits except the marginal visit represents the net economic value generated by the resource and is measured by the area under the demand curve. Since the total number of visits taken (2,700) as shown in Figure 3 are taken at zero added cost (P_0 equals zero), the consumer surplus value is the entire area under the curve.

While the magnitude of this consumer surplus value may be expressed in monetary terms, this value is not involved in exchange and, therefore, does not necessarily influence the economic activity of a region that includes this resource. Wennergren (1967b) points out that the estimated value of the resource is a monetary expression of the worth extracted by recreators from a recreation experience, over their cost of participation. He emphatically concludes that "the worth of the resource is not extracted in monetary units, it is only expressed in such units" (Wennergren, 1967b, p. 15).

The alternative valuation method commonly used by economic researchers with the two-stage Clawson-Hotelling procedure to value outdoor recreation is the nondiscriminating monopolist method. Brown, Singh, and Castle (1964, p. 28) defined the net economic value of sport fishing as "the estimated value of the sport fishery to a single owner who could charge for the opportunity of fishing." A rational monopolistic owner of a resource would want to maximize the total revenue obtained from the use of the resource. To do so, he must select a single "optimum" price to charge for the product of that resource, since he cannot, as a practical matter, discriminate between consumers relative to price. (Total discrimination would achieve the same value for total revenue as the consumer surplus value.) The price to charge in order to maximize total revenue corresponds to the point of unitary elasticity on the demand curve. The revenue estimate reflects that portion of consumer surplus which could be extracted by monopoly pricing. Unitary elasticity on the demand curve simply defines that point where price times quantity is maximized. Figure 5 shows the relationship between demand, marginal revenue and maximum total revenue at unitary elasticity for a simple linear demand function. The shaded area (P_0Q_0) is the value of the resource to its users or as Brown describes it, "the net economic value of the resource" (Brown, Singh, and Castle, 1964, p. 28).

For example, referring back to Figure 3 and Table 2, estimates of total visits taken from all origins at alternative incremental costs were calculated. When these total visit estimates are multiplied by their corresponding incremental cost, alternative total revenues are derived (see the last row of Table 2). Total revenue is maximized at $2.00 added cost, since $1,400 is the highest total revenue that can be gained by a nondiscriminating monopolist given the underlying demand relationship (assuming discrete increments of $1 each).

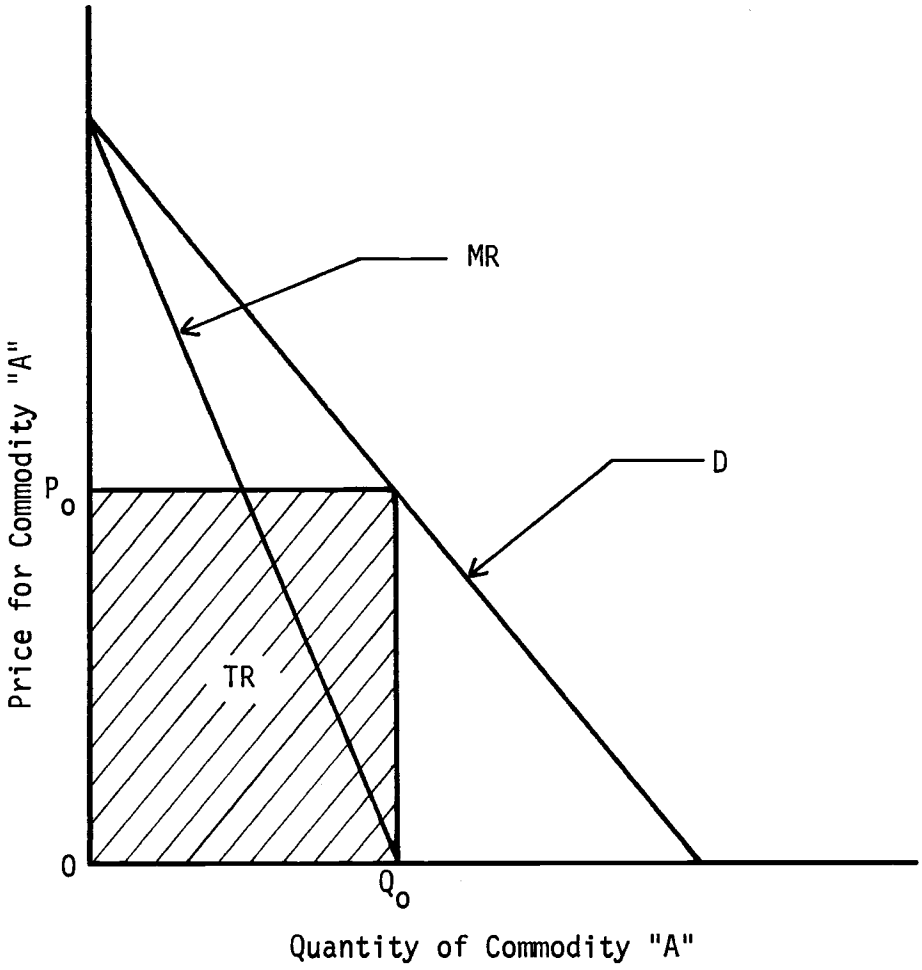

FIGURE 5

Relationship Between Demand, Marginal Revenue, and Total Revenue.

CHAPTER III

Description and Characteristics of the Representative Sites and their Visiting Households

The second-stage demand relationships and the empirical estimates of value for each representative site are presented in Chapter IV. Descriptions of these sites and their visitors are presented below in order to show just who is buying what kind of product. Figure 6 shows the location of the sites within the National Forests and the Salt-Verde Basin. As explained in Appendix A, because of requirements in sampling, it was not practical for all of the selected sites to be completely within the Salt-Verde Basin. Instead, one site from each National Forest was chosen, with several sites closely abounding the basin.

Luna Lake

Luna Lake is located in the Apache National Forest, a few miles east of Alpine in Apache County. The elevation in this area exceeds 8,000 feet and the vegetation consists mainly of spruce, pine, and aspen. The recreation use season is from April through October. The site consists of a 75-surface-acre lake, a campground with forty developed family units, a picnic area, a boat launch, a boat rental and a grocery concession. The major recreation activity at this site is fishing and camping.

The site has easy access from U. S. Highway 180 and since it is located very near the New Mexico border, many of its visitors reside in New Mexico or El Paso, Texas. One-fourth of its visitors reside in the Phoenix area and about one-third reside outside the state of Arizona. The majority of visitors travel over 200 miles one-way to reach this site. Most households do not make one-day outings to Luna Lake. According to the sample taken, households spend an average of four days per trip at this site. The majority of households visited Luna Lake only once in a year.

Table 4 describes the socioeconomic characteristics of the sample of households that visited Luna Lake in 1972. Approximately 50 percent of the heads of households in the sample were in the 36-55 year age group with about 25 percent above and below the 36-55 year age group. About 88 percent of the heads of households had at least a high school education and almost 48 percent had some college education.

The greatest single class of visitors were couples without children. Almost 46 percent of the households had incomes of between $9,000 and $15,000, while 9 percent had less than $6,000 and 13 percent had incomes greater than $21,000. Nine percent of the heads of households were of Mexican-American ethnic background while almost all others were of white (except Mexican-American) ethnic background.

Black Canyon Lake

This site is part of the Sitgreaves National Forest and is situated about 20 miles southwest of Heber in Coconino County atop the Mogollon Rim. The elevation at the lake is about 7,000 feet and the vegetation is mainly ponderosa pine.

The recreation season at Black Canyon Lake normally ranges from April through October, depending upon weather conditions. Access is by way of a seven mile stretch of unpaved road from State Highway 160. After lengthy winters and/or heavy rains, access to the site is severely limited.

The site consists of a 78-surface-acre lake with a boat launch, paved parking areas and picnic facilities. Overnight camping is not allowed at the site itself, but several miles from the site there are areas where camping is allowed. Many of the households that visit Black Canyon Lake do so as a day side-trip from some other lake, campsite, or town less than 75 miles distant. The major activity at this site is cold water fishing.

Three-fourths of the households that recreate at Black Canyon Lake take no more than two trips per year. The average length of stay per trip is one day. The site is close enough to the Phoenix metropolitan area that weekend trips can be undertaken, though heaviest use is during the summer when the majority of households take their vacations. Over 80 percent of its visitors reside in the Phoenix metropolitan area.

Table 5 describes the socioeconomic characteristics of the sample of households that visited Black Canyon Lake during the 1972 outdoor recreation season. Approximately 45 percent of the heads of households that visited Black Canyon Lake in 1972 were between the ages of 36 and 55, 5 percent fewer than those visiting Luna Lake. Most of this difference is made up in the 17 to 25 year age group which has 5 percent more than the same age group for Luna Lake. The education levels of the heads of households that visited this site were al-

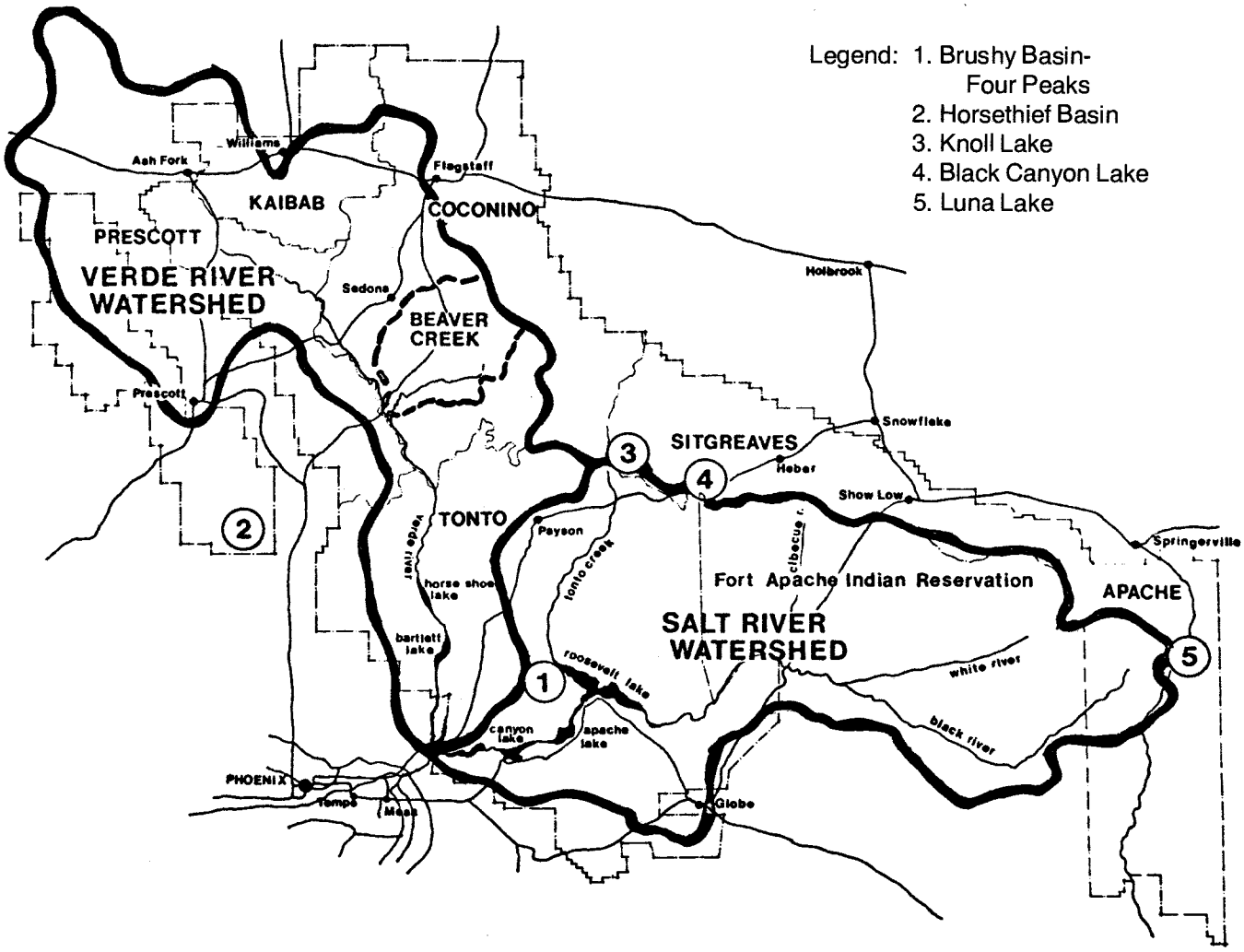

FIGURE 6

Outline of the Salt-Verde Watershed and Location of the Study Sites.

TABLE 4

Socioeconomic Characteristics of Households Visiting Luna Lake, 1972.[1]

Age Distribution of Heads of Households		Education of Heads of Households		Household Size	
Age	Percent of Heads of Households	Education in Years	Percent of Heads of Households	Number in Household	Percent of Household
17-25	5.5	Elementary (6 or less)	1.3	1	5.1
26-35	21.5	Junior High (7-9)	10.4	2	35.4
36-45	24.4	High School (10-12)	40.4	3	17.1
46-55	25.3	College (13-16)	33.5	4	21.5
56-64	14.0	Graduate and Post Graduate (17 or more)	14.4	5	11.3
65 and Over	9.3	TOTAL	100.0	6-8	8.9
TOTAL	100.0			9 or more	.7
				TOTAL	100.0

TABLE 4—*Continued*

Household Income	
Income Bracket in Dollars	**Percent of Households**
0- 2,999	1.6
3,000- 5,999	7.1
6,000- 8,999	14.9
9,000-11,999	27.3
12,000-14,999	18.6
15,000-17,999	10.2
18,000-20,999	7.5
21,000-23,999	4.7
24,000-26,999	3.3
27,000-29,999	1.3
30,000 or more	3.5
TOTAL	100.0

Ethnic Backgrounds of Households	
Ethnic Background	**Percent of Households**
White, except Mexican-American	90.7
Black	0
Mexican-American	8.9
Oriental	.2
American Indian	.2
Other	0
TOTAL	100.0

[1]Based on a sample of households registering at the site during the 1972 outdoor recreation season.

TABLE 5

Socioeconomic Characteristics of Households Visiting Black Canyon Lake, 1972.[1]

Age Distribution of Heads of Households	
Age	**Percent of Heads of Households**
17-25	10.3
26-35	23.3
36-45	24.5
46-55	21.4
56-64	14.4
65 and Over	6.1
TOTAL	100.0

Education of Heads of Households	
Education in Years	**Percent of Heads of Households**
Elementary (6 or less)	0
Junior High (7-9)	10.5
High School (10-12)	42.5
College (13-16)	36.7
Graduate and Post Graduate (17 or more)	10.3
TOTAL	100.0

Household Size	
Number in Household	**Percent of Household**
1	8.3
2	28.1
3	15.0
4	22.5
5	14.2
6-8	11.1
9 or more	.8
TOTAL	100.0

Household Income	
Income Bracket in Dollars	**Percent of Households**
o- 2,999	1.1
3,000- 5,999	9.2
6,000- 8,999	12.8
9,000-11,999	23.0
12,000-14,999	19.4
15,000-17,999	14.2
18,000-20,999	10.0
21,000-23,999	3.1
24,000-26,999	1.9
27,000-29,999	1.1
30,000 or more	4.2
TOTAL	100.0

Ethnic Backgrounds of Households	
Ethnic Background	**Percent of Households**
White, except Mexican-Americans	97.8
Black	.3
Mexican-American	.8
Oriental	0
American Indian	1.1
Other	0
TOTAL	100.0

[1]Based on a sample of households registering at the site during the 1972 outdoor recreation season.

most the same as those that visited Luna Lake; about 90 percent attained at least a high school education and 48 percent had some college education.

In contrast to Luna Lake, there was a greater tendency for the households visiting Black Canyon Lake to consist of three or more members. The household incomes of visitors to this site are very slightly higher than incomes of those recreating at Luna Lake. Almost 35 percent had incomes over $15,000 whereas 30 percent of the recreators at Luna Lake had incomes greater than $15,000. Almost 98 percent of the heads of households visiting Black Canyon Lake were of white (except Mexican-American) ethnic background

Knoll Lake

Knoll Lake is also located on the Mogollon Rim in an area of mostly ponderosa pine. The lake is in the Coconino National Forest about fifty miles north of Payson and 25 miles south of the Blue Ridge Ranger Station. The elevation is approximately 7,500 feet.

The recreation use season under normal conditions is from May through September. The season often is shortened due to late winters or heavy rains which make the 30 miles of unpaved Old Rim Road, the only access to this site, quite difficult. Access to the Old Rim Road can be gained from either State Highway 87 west of the site or State Highway 260 east of the site. The distance from either point of access to the site is approximately the same.

Knoll Lake is a 77-surface-acre lake with a boat launch. It is one of numerous lakes established by the Arizona Game and Fish Department on the Mogollon Rim. Camping facilities for about 40 families are a few hundred yards away from the lake. The major activities at this site are camping and cold water fishing.

The site is about 150 miles from the Phoenix metropolitan area where approximately 80 percent of its visitors reside. Some of the households that visit do so only on a day-use basis. However, since there are many lakes within close proximity of each other on the Mogollon Rim, many of its users establish a home camp and then during their stay in the area travel to several sites. Over 80 percent of the visiting households took no more than two trips per year to this site and during their visit the average length of stay was two days.

Table 6 lists the socioeconomic characteristics of the sample of households that visited Knoll Lake during the 1972 outdoor recreation season. About 45 percent of the heads of households visiting Knoll Lake were between the ages of 36 and 55; 5 percent fewer than those that visited Luna Lake and about the same as at Black Canyon Lake. Almost 43 percent of the visitors were in the 17 to 35 year age bracket; heads of households visiting Knoll Lake are typically younger than those that visited either Luna Lake or Black Canyon Lake. Approximately 92 percent of the heads of households attained at least a high school education, 4 percent more than those that visited Luna Lake. About 52 percent had some college education; this is also 4 percent more than those heads of households that visited either Luna Lake or Black Canyon Lake.

The size of the households visiting Knoll Lake was very similar to the households visiting Black Canyon Lake. About 65 percent of the households consisted of three or more members. About 42 percent of the households had incomes that ranged between $9,000 and $15,000, very much like the other two sites discussed. Only 7 percent had incomes below $6,000 as compared to 9 percent for Luna Lake and 10 percent for Black Canyon Lake. Almost 98 percent of the heads of households visiting Knoll Lake were of white (except Mexican-American) ethnic background, the same percent as for Black Canyon Lake.

Horsethief Basin

Horsethief Basin is in the Bradshaw mountains about 80 miles north of the Phoenix metropolitan area in the Prescott National Forest. The elevation at the site is 6,000 feet. The vegetation is primarily ponderosa pine.

The recreation use season normally ranges from May through November. Access is from Interstate 17, about 40 miles north of Phoenix. From that point the next 30 miles of road are rough, winding, and narrow, increasing in elevation from 1,500 feet to over 6,000 feet at the site. Almost 90 percent of the site's users reside in the Phoenix metropolitan area.

The Basin has several distinct picnic areas and campsites that permit overnight camping. A very small reservoir, whose main purpose is to provide water for Crown King and the Basin, allows a limited amount of fishing. Both in nearby Crown King and the Basin, grocery concessions are available. During the peak summer season, cabins are available for rent. In addition, there are also about forty summer homes in the area. The site is most heavily used on weekends and holidays.

Over 80 percent of the visiting households take one or two trips per year with an average length of stay of two days per trip.

Table 7 describes some of the socioeconomic characteristics of the sample of the households visiting Horsethief Basin. Almost 46 percent of the heads of households visiting Horsethief Basin were between the ages of 36 and 55; this is slightly less than Luna Lake, but about the same as Black Canyon Lake and Knoll Lake. Only 9 percent of the visitors exceeded age 55 compared to 11 percent for Knoll Lake, 20 percent for Black Canyon Lake and 23 percent for Luna Lake. A much larger percent of the heads of households visiting Horsethief Basin (63 percent) had at least some college education as compared to 48 percent for Luna Lake and 52 percent for Knoll Lake.

The size of the households visiting this site are similar to the households that visited both Black Canyon Lake and Knoll Lake. Approximately 66 percent of the households consisted of three or more members. Slightly more than 43 percent of the households had incomes that ranged between $9,000 and $15,000, very similar

TABLE 6

Socioeconomic Characteristics of Households Visiting Knoll Lake, 1972.[1]

Age Distribution of Heads of Households	
	Percent of Heads of Households
17-25	13.0
26-35	29.7
36-45	24.6
46-55	21.0
56-64	8.9
65 and Over	2.8
TOTAL	100.0

Education of Heads of Households	
Education in Years	Percent of Heads of Households
Elementary (6 or less)	.6
Junior High (7-9)	7.0
High School (10-12)	40.1
College (13-16)	37.8
Graduate and Post Graduate (17 or more)	14.5
TOTAL	100.0

Household Size	
Number in Household	Percent of Household
1	8.3
2	26.7
3	18.7
4	20.7
5	14.4
6-8	10.1
9 or more	1.1
TOTAL	100.0

Household Income	
Income Bracket in Dollars	Percent of Households
0- 2,999	1.4
3,000- 5,999	6.0
6,000- 8,999	14.5
9,000-11,999	21.5
12,000-14,999	20.8
15,000-17,999	15.9
18,000-20,999	8.5
21,000-23,999	4.8
24,000-26,999	2.5
27,000-29,999	.8
30,000 or more	3.3
TOTAL	100.0

Ethnic Backgrounds of Households	
Ethnic Background	Percent of Households
White, except Mexican-American	97.7
Black	0
Mexican-American	1.5
Oriental	.2
American Indian	.6
Other	0
TOTAL	100.0

[1] Based on a sample of households registering at the site during the 1972 outdoor recreation season.

to other sites. Sixteen percent, though, had incomes of $21,000 or more per year as opposed to only 10 percent for Black Canyon Lake and 13 percent for Luna Lake. Over 98 percent of the heads of households were of white (except Mexican-American) ethnic background, a similar fact observed for both Black Canyon Lake and Knoll Lake.

Brushy Basin-Four Peaks

The Brushy Basin-Four Peaks area covers several thousand acres about 60 miles northeast of the Phoenix metropolitan area on the west slope of the Mazatzal Divide. A drive through the area passes from the lower elevation desert shrubs, through the chaparral type, to the higher elevation ponderosa pine near Four Peaks Mountain.

Over a three-year period (1962-1965) about 5,000 acres of dense chaparral brush in the Basin were burned off and seeded with weeping lovegrass. This conversion created a patchwork of grass and brush which significantly improved mobility within the area by game, man and livestock.

The type of recreation carried on at this site is referred to by the U.S. Forest Service as dispersed recreation. There are no developed campsites or facilities in the entire area. Recreational activities include hiking, camping, rock hounding, sightseeing, hunting, and cross-country cycling. While these activities are carried on in this area on a year-round basis, peak season is the spring and late fall. Most of the use occurs during weekends and holidays. Access to the area is either from State Highway 87 west of the site or from State Highway 188 east of the site. Approximately 20 to 30 miles of narrow dirt road must be traversed after leaving the state highways. The use of conventional automobiles to reach the area is discouraged by road signs.

Over 98 percent of the sample of visiting households reside in the Phoenix metropolitan area. Of these, 45 percent live in Scottsdale and Mesa. The majority of the trips taken to Brushy Basin are one day in duration. Over 40 percent of the households took 2 to 5 trips per year.

Table 8 describes the socioeconomic characteristics of households sampled at Brushy Basin-Four Peaks in

TABLE 7

Socioeconomic Characteristics of Households Visiting Horsethief Basin, 1972.[1]

Age Distribution of Heads of Households		Education of Heads of Households		Household Size	
Age	Percent of Heads of Households	Education in Years	Percent of Heads of Households	Number in Household	Percent of Households
17-25	13.3	Elementary (6 or less)	0	1	9.9
26-35	31.7	Junior High (7-9)	2.4	2	23.9
36-45	27.0	High School (10-12)	34.5	3	16.7
46-55	18.8	College (13-16)	44.7	4	23.3
56-64	6.8	Graduate and Post Graduate (17 or more)	18.4	5	12.6
65 and Over	2.4	TOTAL	100.0	6-8	11.9
TOTAL	100.0			9 or more	1.7
				TOTAL	100.0

Household Income		Ethnic Backgrounds of Households	
Income Bracket in Dollars	Percent of Households	Ethnic Background	Percent of Households
0- 2,999	2.1	White, except Mexican-American	98.3
3,000- 5,999	4.8	Black	0
6,000- 8,999	12.6	Mexican-American	1.4
9,000-11,999	22.2	American Indian	0
12,000-14,999	21.2	Oriental	.3
15,000-17,999	14.3	Other	0
18,000-20,999	6.8	TOTAL	100.0
21,000-23,999	6.1		
24,000-26,999	1.7		
27,000-29,999	3.1		
30,000 or more	5.1		
TOTAL	100.0		

[1] Based on a sample of households registering at the site during the 1972 outdoor recreation season.

TABLE 8

Socioeconomic Characteristics of Households Visiting Brushy Basin—Four Peaks, 1972.[1]

Age Distribution of Heads of Households		Education of Heads of Households		Household Size	
Age	Percent of Heads of Households	Education in Years	Percent of Heads of Households	Number in Household	Percent of Households
17-25	25.9	Elementary (6 or less)	.8	1	15.9
26-35	30.7	Junior High (7-9)	4.1	2	25.6
36-45	20.7	High School (10-12)	32.6	3	14.1
46-55	12.4	College (13-16)	44.7	4	21.7
56-64	5.4	Graduate and Post Graduate (17 or more)	17.8	5	11.1
65 and Over	4.9	TOTAL	100.0	6-8	10.5
TOTAL	100.0			9 or more	1.1
				TOTAL	100.0

TABLE 8—*Continued*

Household Income	
Income Bracket in Dollars	**Percent of Households**
0- 2,999	3.8
3,000- 5,999	5.9
6,000- 8,999	11.6
9,000-11,999	19.1
12,000-14,999	18.1
15,000-17,999	15.6
18,000-20,999	10.7
21,000-23,999	5.2
24,000-26,999	4.1
27,000-29,999	1.4
30,000 or more	4.5
TOTAL	100.0

Ethnic Background of Households	
Ethnic Background	**Percent of Households**
White, except Mexican-American	99.0
Black	0
Mexican-American	.7
American Indian	0
Oriental	.3
Other	0
TOTAL	100.0

[1] Based on a sample of households registering at the site during the 1972 outdoor recreation season.

1972. The sample indicates that the heads of households at this site are younger than at any other of the sampled sites. Over 55 percent are in the 17-35 year age bracket. Almost 63 percent of the heads of household had some college education. This characteristic resembles households that visited Horsethief Basin, but is higher than for the other selected sites.

Over 40 percent of the households consisted of 1 to 2 family members, a figure that is similar to households that visited Luna Lake. The difference becomes evident when comparing the ages of the households visiting the two sites. Households visiting Brushy Basin are relatively young and have not established a family, whereas households visiting Luna Lake are in the age brackets where the children no longer reside with their parents.

Although a smaller percent (37 percent) of the households visiting Brushy Basin had incomes between $9,000 and $15,000 compared to the other sites, almost 42 percent had incomes in excess of $15,000. Almost all the heads of households that visited Brushy Basin-Four Peaks were of white (except Mexican-American) ethnic background.

Summary

As shown in Table 9, the selected representative sites are quite diverse in terms of elevation, vegetation, access, development, nearness to a large population center, and types of activities engaged in by recreators.

The elevation ranges from a low of 2,000 feet in parts of Brushy Basin, where vegetation is primarily desert shrub, to a high of over 8,000 feet at Luna Lake where the vegetation consists mainly of spruce and pine.

Access to the sites ranges from extremely easy at Luna Lake, to a seven mile dirt road at Black Canyon Lake, to 30 miles of unpaved road at Knoll Lake, to 20 miles of narrow, rough, and winding road at Brushy Basin. The sites range in distance from the Phoenix metropolitan area from 60 miles for Brushy Basin to 250 miles for Luna Lake.

Development at the selected representative sites ranges from no development at Brushy Basin to a high degree of development at Luna Lake and Horsethief Basin where grocery concessions are available as well as campsites with shelters, boat rentals, water, toilets, and rental cabins.

All of the sites except Brushy Basin have water-based recreation available. A wide range of outdoor recreation activities may be undertaken at all sites.

Table 10 is a summary of the socioeconomic characteristics of the samples of households that visited the selected representative sites in 1972. The representative age of heads of households visiting Brushy Basin is 28, the youngest for all the sites sampled, as compared to the oldest representative age of 47 for Luna Lake.

The representative level of education attained by heads of households visiting Luna Lake, Knoll Lake, and Black Canyon Lake is 12 years, while those visiting Horsethief Basin and Brushy Basin is 14 years.

The size of the households ranged from a low of 3.3 members for Brushy Basin and Luna Lake to 3.6 members for Horsethief Basin.

The highest representative family income level was recorded by households visiting Knoll Lake and Horsethief Basin at $11,700 per year. The lowest representative income level was recorded for households visiting Luna Lake at $10,800 per year.

The representative ethnic background for all sites was predominantly white. Very few households from ethnic minority groups participated in outdoor recreation at any of the selected representative sites except for Luna Lake.

TABLE 9

Summary of Characteristics of the Selected Representative Sites.

Recreation Site	Elevation	Vegetation	Access from Major Highways	One way distance from Phoenix Metropolitan Area
Luna Lake	8,000 ft.	Spruce, pine, aspen	Easy	250 miles
Black Canyon Lake	7,000 ft.	Ponderosa pine	7 miles dirt road	140 miles
Knoll Lake	7,500 ft.	Ponderosa pine	30 miles unpaved road	150 miles
Horsethief Basin	6,000 ft.	Ponderosa pine	30 miles winding, unpaved road	80 miles
Brushy Basin—Four Peaks	2,000 to 7,000 ft.	Desert shrub and ponderosa pine	20 miles winding, rough unpaved road	60 miles

Recreation Site	Development	Main Activities	Recreation Season
Luna Lake	Grocery concession, camp sites, picnic areas, shelters, water, toilets	Camping, picnicking, cold water fishing	May-November
Black Canyon Lake	Boat ramp, picnic area, paved parking, toilets	Cold water fishing	April-October
Knoll Lake	Family campsite, toilets	Cold water fishing, camping	May-September
Horsethief Basin	Grocery concession, camp sites, picnic areas, shelters, cabin rentals, water, toilets	Camping, picnicking	May-November
Brushy Basin—Four Peaks	No development	Camping, hiking, rock-hounding, cycling	All year

TABLE 10

Summary of Socioeconomic Characteristics of Households Visiting the Selected Representative Sites, 1972

Recreation Site	Representative Age of Heads of Households[1]	Representative Education of Heads of Households[1]	Representative Household Size[2]	Representative Household Income[1]	Representative Ethnic Background
Luna Lake	47	12	3.3	$10,800	White, except Mexican-American
Black Canyon Lake	39	12	3.5	$11,200	White, except Mexican-American
Knoll Lake	33	12	3.5	$11,700	White, except Mexican-American
Horsethief Basin	33	14	3.6	$11,700	White, except Mexican-American
Brushy Basin—Four Peaks	28	14	3.3	$11,300	White, except Mexican-American

[1] Modal Value
[2] Mean Value

CHAPTER IV

Estimated Economic Values and Demand Functions for the Five Representative Sites

The Measure of Participation

Much of the literature on outdoor recreation has defined the quantity of recreation taken in terms of an individual user-day or user-trip. Such is not the case in this study. Based on the work of Martin, Gum and Smith (1974) and the original suggestion of Outdoor Recreation Resources Review Commission Report (USDI, 1962), the household, as a composite of its elements, was determined to be the consumer unit.

The decision to use this definition was based upon the assumption that the household is the decision-making unit. Even though a member of a household can participate in a recreational activity on his own accord, the person still functions within the general decision-making framework of the household. The household is the basic unit "that finances recreation out of a common household budget, and the decision to participate is presumed to have household sanction" (ORRRC, 1962).

Thus, the demand functions developed for each site are expressed in terms of household-days per dollar of added cost. Values are expressed either as the total value per year per site (either consumer surplus or nondiscriminating monopolist value), the average consumer surplus value per household-day, or the nondiscriminating monopolist price per household-day. The latter measure could be considered as the "optimum" daily fee per automobile, if the managing agency wished to collect the maximum possible revenue per year from the users of the site.

Summary of Values

Both consumer surplus and nondiscriminating monopolist values are summarized for each of the five representative sites in Table 11. For example, the Luna Lake site generated a consumer surplus value (total net benefit) of $1,117,539 in 1972. Associated with this value were 42,751 household-days creating a mean consumer surplus per day of $26.14.

The nondiscriminating monopolist value estimated for Luna Lake in 1972 is $483,327. This is the maximum amount of money that could have been collected if households had been charged a fee on a per day basis for visiting the site. The fee that would have generated this maximum collectable revenue of $438,327 was $27 per day. However, at a fee of $27 per day, only 17,901 household-days would have been taken rather than the 42,751 household-days that were actually taken in 1972.

It happens that the nondiscriminating monopolist price of $27 per household-day is very close in size to the mean consumer surplus value per household-day of $26.14. This similarity in size is mere happenstance, although it does occur for each of the representative sites shown in Table 11. Note that the number of days associated with the nondiscriminating monopolist price is only 42 percent of the number of days taken at zero added cost at Luna Lake. At the other sites, each with relatively similar nondiscriminating monopolist prices and mean consumer surplus values, the percent of visits at the monopolist price compared to actual visits at zero additional cost are 31 percent, 46 percent, 56 percent and 26 percent at Black Canyon Lake, Knoll Lake, Horsethief Basin and Brushy Basin-Four Peaks, respectively.

The estimates given in Table 11 were all selected by the authors from a number of possibilities as being the "most reasonable estimates." Estimation problems and possibilities are described in detail in Appendix A. Each site presented somewhat different estimation problems, a general discussion of which aids in the interpretation of the value estimates presented, and which is given below. In every case the authors attempted to select an estimate from a sound statistical demand estimate that would give a conservative, that is a minimum, estimate of value. Thus, one may say that values are "at least as high as" shown in Table 11, except for Black Canyon Lake where an upper and a lower estimate probably bracket the "true" value.

(A conceptual problem leading to some upward bias in value is discussed in Appendix B. On the other hand, there is a quality dimension to the problem of recreation evaluation that could create downward bias. At least for some people, the quality of the recreational experience improves as the price of the experience is raised and congestion at the site decreases. Since, in this analysis, quality of the experience was assumed constant, downward bias in value may result—consistent with the authors' desire to produce a conservative, "at least as high as," estimate. However, quality is in the eye of the beholder and each recreation

TABLE 11

Estimated Net Economic Values Generated in 1972 by Five Representative Sites in the Salt-Verde Basin of Arizona.

Site	Consumer Surplus Value ($)	Average Consumer Surplus Value per Household-day ($)	Associated Number of Household-Days	Nondiscriminating Monopolist Value ($)	Nondiscriminating Monopolist Price ($)	Associated Number of Household-Days
Luna Lake	1,117,539	26.14	42,751	483,327	27	17,901
Black Canyon Lake						
Upper estimate	772,413	42.14	18,330	270,579	47	5,757
Lower estimate	427,286	42.14	10,140	149,695	47	3,185
Knoll Lake	861,750	46.93	18,363	338,240	40	8,456
Horsethief Basin	125,609	9.85	12,750	64,719	9	7,191
Brushy Basin—Four Peaks	12,200	1.49	8,195	4,200	2	2,100

experience must be evaluated on its own merits as viewed by the recreators. For example, Boster, Gum and Monarchi (1973), found that many people on Grand Canyon river trips obtained a sense of security from seeing other people along the way.)

The statistical demand function for Luna Lake presented no problems. A reasonable fit to the data was obtained using all sample observations. However, for Black Canyon Lake, Knoll Lake and Horsethief Basin, it was necessary to partition the samples in order to separate response characteristics of two classes of households. A modification of method was necessary for Brushy Basin-Four Peaks.

Visitors to Black Canyon Lake were classed as those for which the Lake was their primary destination and those for which the Lake was basically a side-trip. One-way travel distances for side trips were 75 miles or less. When side-trippers were excluded from the sample, the regression analysis gave good results, indicating days taken as a function of variable costs. Including side-trippers introduced too much "noise" into the regression analysis since these households tended to have both low costs and a low number of days of visitation. Therefore, two sets of estimates are presented for Black Canyon Lake in Table 11. The lower estimate, based on the statistical demand curve developed in the regression analysis includes only those visitors for which Black Canyon Lake was their primary destination. The upper estimate is based on the same equation but includes all households visiting the Lake, assuming that the side-trip households obtain the same mean benefits per day as do the households for which the Lake is a primary destination. It is likely that this assumption overestimates value for the side-trip portion of the sample. Thus, the upper estimate is probably slightly high.

The sample was also partitioned for Knoll Lake and Horsethief Basin, but on a different basis. These two sites were both the primary destinations of most visitors. In fact, at each site there was a group of households taking over eight days at the site with apparent disregard to cost. Households taking eight or less days at the sites reacted in the expected fashion, where days of visits were inversely related to costs. Thus, the demand functions were estimated excluding the households taking over eight days. Then, as with Black Canyon Lake, the excluded households were added back in when the value estimates were made, assuming that the households with high usage of the sites received the same mean benefits per day as the low-usage households. Since the high-usage households are a group that obviously has an unusually high preference for recreation at these sites, this assumption obviously underestimates the total value of the sites. Because the value estimates at both sites are underestimates and thus are "conservative," only one set of estimates is presented for each site in the summary table.

Brushy Basin-Four Peaks is very near the Phoenix metropolitan area where 96 percent of its recreators reside. This proximity seemed to negate the importance of time or money costs as explanatory variables in the Clawson-Hotelling approach to the number of days actually taken at this site. Since a statistical demand function based on actual days and associated cost could not be generated, a modification in method was devised.

In addition to data on actual happenings, respondents to the questionnaire had been asked how much they would be willing to pay per day for the use of the recreation area rather than be excluded. The positive relationship between willingness to pay and actual days visited formulated a measure of tastes and preferences for recreating at this site. This method of estimating recreational benefits may not be as reliable as the method applied to the other sites due to the hypothetical nature of the questions which could result in biased answers from the respondents. It is quite possible that a respondent unconsciously or deliberately understates his preference for a recreation site in the hope that by doing so, if a fee actually ever is charged, the charge would be smaller than the amount that he is actually willing to pay. Therefore, one would expect the estimates of Table 11 for the Brushy-Four Peaks area to be underestimates of the true value of net benefits. (It is theoretically possible that willingness to pay would be overstated if the respondent felt that giving high value would lead to increased provision of facilities and the respondent desired more facilities.

Since visitors to Brushy-Basin were almost all anti-development, this possibility is unlikely.)

Demand Functions for Each Site

Tables 12 through 16 give, by site, all the alternative revenues that could have been collected, and the associated numbers of household-days that would have been taken if alternative added costs (entry fees) had been charged in 1972 above the households' actual variable cost of participation. Each of the schedules shown in these five tables are the data from alternative points along the second-stage demand function for the site. The maximum total revenue shown is the nondiscriminating monopolist value. The associated added cost per day is the nondiscriminating monopolist price.

For example, Table 12 gives the demand schedule at Luna Lake for visits of one household-day. In 1972, an estimated 42,751 household-days were taken at this site. A certain amount of variable expense was associated with these trips, but there was only a minimal camping fee at the site, and added costs were zero. Had there been added costs of $5 per household-day, imposed either as an entry fee or simply occurring for any other reason associated with making the trip, it is estimated that only 37,087 household-days would have been taken. If the added cost was in the form of a fee, $185,435 would have been collected.

If higher levels of added cost had occurred, the number of days taken would have been less and less until, if an added cost of $67 per household-day had occurred, no days would have been taken. Had the added cost been in the form of an entry fee, total revenues could have been maximized at a price of $27 per day even though the number of days taken would have been less than at a lower price. In the lower price range, demand for recreation at this site is termed "inelastic"—increasing prices bring greater revenues even though less of the commodity is sold; at prices of more than $27 per household-day, demand is "elastic"—higher prices would cause fewer days taken and lower revenues until days and revenues would finally fall to zero.

The highest total revenue obtainable with its associated price is termed the nondiscriminating monopolist value of the resource and the nondiscriminating monopolist price, respectively.

In Tables 13, 14, and 15 two sets of demand functions are given. The reasoning for partitioning the samples and the effect on the reliability of the estimates were discussed in the previous section.

TABLE 12

Estimates of Resource Values for Luna Lake at Alternative Added Costs, 1972.

Added Cost Per Day ($)	Number of Household Days Per Year	Total Revenue ($)
0	42,751	0
5	37,087	185,435
10	32,094	320,940
15	27,499	412,485
20	23,226	464,520
25	19,273	481,825
27[1]	17,901	483,327[2]
30	15,968	479,040
35	12,791	447,685
40	10,110	404,400
45	7,687	345,915
50	5,909	295,450
55	4,206	231,330
60	1,894	113,640
65	616	40,040
67	0	0

[1]Nondiscriminating monopolist price.

[2]Nondiscriminating monopolist value.

TABLE 13

Estimates of Resource Values for Black Canyon Lake at Alternative Added Cost, 1972.

	Households with Black Canyon Lake as Principal Destination		All Households	
Added Cost Per Day ($)	Number of Household Days[1] Per Year	Total Revenue[1] ($)	Number of Household Days[2] Per Year	Total Revenue[2] ($)
0	10,140	0	18,330	0
5	8,772	43,860	15,857	79,285
10	7,618	76,180	13,771	137,710
15	6,659	99,885	12,037	180,555
20	5,881	117,620	10,631	212,620
25	5,201	130,025	9,402	235,050
30	4,607	138,210	8,328	249,840
35	4,143	145,005	7,489	262,115
40	3,713	148,520	6,712	268,480
45	3,320	149,400	6,001	270,045
47[3]	3,185	149,695[4]	5,757	270,579[4]
50	2,983	149,150	5,392	269,600
75	1,716	128,700	3,102	232,650
100	974	97,400	1,761	176,100
150	378	56,700	683	102,450
200	193	38,600	349	69,800
250	43	10,750	78	19,500
276	0	0	0	0

[1]Based on a sample of households that traveled a one-way distance greater than 75 miles from point of origin to site.

[2]Based on total sample, assuming that households traveling a one-way distance less than 75 miles would react to a price increase in the same way as households traveling more than 75 miles. This assumption probably underestimates the reaction of the short-trip households to price increases and thus overestimates collectable revenue.

[3]Nondiscriminating monopolist price.

[4]Nondiscriminating monopolist value.

TABLE 14

Estimates of Resource Values for Knoll Lake at Alternative Added Costs, 1972.

	Households Visiting Horsethief Basin for Eight or Less Days Per Year		All Households	
Added Cost Per Day ($)	Number of Household Days[1] Per Year	Total Revenue[1] ($)	Number of Household Days[2] Per Year	Total Revenue[2] ($)
0	10,914	0	18,363	0
5	10,079	50,395	16,958	84,790
10	9,261	92,610	15,582	155,820
15	8,445	126,675	14,209	213,135
20	7,634	152,680	12,844	256,880
25	6,903	172,575	11,614	290,350
30	6,275	188,250	10,558	316,740
35	5,649	197,715	9,504	332,640
40[3]	5,026	201,040[4]	8,456	338,240[4]
45	4,406	198,270	7,413	333,585
50	3,958	197,900	6,659	332,950
75	2,109	158,175	3,548	266,100
100	1,118	111,800	1,881	188,100
125	627	78,375	1,055	131,875
150	290	43,500	488	73,200
175	122	21,350	205	35,875
204	0	0	0	0

[1]Based on a sample of households taking eight or fewer days per year at this site and representing 88.4 percent of the sample households.

[2]Based on the total sample, assuming that households with high usage of the site would react to a price increase in the same way as households visiting the site for eight days or less. This assumption probably overestimates the reaction of the high-use households to price increases and thus underestimates collectable revenue.

[3]Nondiscriminating monopolist price.

[4]Nondiscriminating monopolist value.

TABLE 15

Estimates of Resource Values for Horsethief Basin at Alternative Added Costs, 1972.

	Households Visiting Horsethief Basin for Eight or Less Days Per Year		All Households	
Added Cost Per Day ($)	Number of Household Days[1] Per Year	Total Revenue[1] ($)	Number of Household Days[2] Per Year	Total Revenue[2] ($)
0	5,427	0	12,750	0
1	4,834	4,834	11,357	11,357
2	4,618	9,236	10,849	21,698
3	4,437	13,311	10,424	31,272
4	4,173	16,692	9,804	39,216
5	4,004	20,020	9,407	47,035
6	3,803	22,818	8,935	53,610
7	3,590	25,130	8,434	59,038
8	3,389	27,112	7,962	63,696
9[3]	3,061	27,549[4]	7,191	64,719[4]
10	2,601	26,010	6,111	61,110
15	846	12,690	1,987	29,805
20	29	580	68	1,360
25	26	650	61	1,525
27	0	0	0	0

[1]Based on a sample of households taking eight or fewer days at this site per year and representing 88 percent of the sample households.

[2]Based on the total sample, assuming that households with high usage of the site would react to a price increase in the same way as households visiting the site for eight days or less. This assumption probably overestimates the reaction of the high-use households to price increases and thus underestimates collectable revenue.

[3]Nondiscriminating monopolist price.

[4]Nondiscriminating monopolist value.

TABLE 16

Estimates of Resource Values for Brushy Basin-Four Peaks at Alternative Added Costs, 1972.

Added Cost Per Day ($)	Number of Household Days Per Year	Total Revenue ($)
0	8,195	0
1	3,700	3,700
2[1]	2,100	4,200[2]
3	1,300	3,900
4	700	2,800
5	350	1,750
6	225	1,350
7	100	700
8	80	640
9	50	450
10	25	250
11	9	0

[1]Nondiscriminating monopolist price.

[2]Nondiscriminating monopolist value.

CHAPTER V
Aggregate Values for the Salt-Verde Basin

Values for Developed Forest Service Sites

Demand functions and net values were estimated for only five representative sites in the Salt-Verde Basin. If these sites are truly representative, however, and if the other sites for which the representative sites are stand-ins can be identified, an aggregate value for outdoor recreation for the whole Basin may be estimated.

Table 17 shows this procedure for that portion of the Salt-Verde Basin which has characteristics similar to the representative site. The very large developed sites in the southern portion of the Tonto National Forest, the large warm water lake area near Phoenix including Roosevelt, Saguaro, Apache, and Canyon Lakes are excluded from Table 17. Also excluded are those portions of the San Carlos and Fort Apache Indian Reservations which fall within the Basin's boundaries.

All of the smaller developed sites managed by the U. S. Forest Service within the Salt-Verde Basin were classified according to the amount of development at a site, the activities available, visitor use, and distance away from the Phoenix metropolitan area. These sites were then matched up as closely as possible with the representative sites and the values assigned to them were totaled. In several cases, where a site was larger than its closest representative, and where visitor use was much higher, the value of the site was estimated as a multiple of the representative site. Since the Brushy Basin-Four Peaks area is not a developed site, it is not used in this table.

Thus, the estimated value of the developed recreation sites listed in Table 17, in their use for outdoor recreation activities including camping, hiking, picnicking and fishing (hunting is excluded), is $20,242,273 under the nondiscriminating monopolist approach and $51,684,318 under the consumer surplus approach.

Values for the Entire Basin and Comparisons with Other Value Estimates

In order to obtain estimates of value for those sites and areas of the Salt-Verde Basin excluded from Table 17, estimates from an economics of recreation study for the entire State of Arizona (Martin, Gum and Smith, 1974) are adapted. The Martin *et al.* study used the same general methodology as in this Salt-Verde study, except it focused on demand for and value of]e areas when used for specific activities such a: er hunting or cold water fishing instead of focusing on specific sites in general recreational use.

In the Martin *et al.* study, each Arizona Game and Fish Management Unit was considered a recreation site and values were estimated for activities by 1970 Game and Fish Regions, using Units as the points of recreational destinations.

Figure 7 depicts the 1970 Arizona Game and Fish Regions (Regions are aggregates of many Units) with an outline of the Salt-Verde Basin. Estimates of the value of portions of these regions lying within the boundaries of the Salt-Verde Basin were computed from values generated by Martin *et al.* for general rural outdoor recreation, cold water fishing and warm water fishing, the major activities enjoyed at the representative sites. Values were computed as proportional to total area. Hunting activities are excluded. These values are presented in Tables 18 and 19. The nondiscriminating monopolist value for the entire Salt-Verde Basin is estimated at $37,312,126. The consumer surplus value for the Basin is $62,276,010.

Using the same procedures, those portions of the Salt-Verde Basin that were excluded from the representative site estimates may also be estimated from the Martin *et al.* data. These estimates, along with those for the entire Basin and those for the representative sites are all summarized in Table 20.

Comparing nondiscriminating monopolist values, Table 20 shows that the sum of the aggregate value of the representative sites, plus the value of the warm water lake area, plus the value of the Indian Reservations equals $36,376,487. This estimate is only $0.9 million less than the value estimated by aggregating over activity and Region in the Martin, Gum and Smith study.

The consumer surplus value as estimated from the Martin *et al.* data was $62,276,010. This value is $16 million less than the value obtained by aggregating up from the values of the representative sites plus the values unaccounted for in the representative site analysis.

Neither set of estimates as given above include the values of hunting in the Basin and, therefore, underestimate the total value of the resource for its use in outdoor recreation including hunting. Values for hunting for each Region in Arizona were estimated by Martin, Gum, and Smith and, in the same manner already described, values for hunting were derived for the Salt-Verde Basin. Tables 21 and 22 show that for the Salt-Verde Basin the nondiscriminating monopolist value of hunting to be $4,153,537 and the consumer surplus value to be $9,158,868 (summarized in Table 20).

It cannot be determined which set of estimates are "correct"—the representative site estimates or the Martin, Gum and Smith estimates. But, the fact that the two sets of estimates are as close together as they are, and were partially developed from completely different sets

TABLE 17

Classification of the Smaller Developed Sites in the Salt-Verde Basin[1] and Their 1972 Values.[2]

	Representative Sites				
	Luna Lake	**Black Canyon Lake**	**Knoll Lake**	**Horsethief Basin**	**Total**
Representative Values					
Nondiscriminating Monopolist Value	$ 483,327	$270,579	$338,240	$ 64,719	
Consumer Surplus Value	$1,117,539	$772,413	$861,750	$125,609	
	Sites Classified by Representative Site				
	Big Lake[5]	South Fork	Diamond Rock	Alpine Divide	
	Lynx Lake	Benny Creek	Lakeview	Clint's Well	
	Hill Top	Greer	Pinegrove	Kehl Springs	
	Lakeside[3]	Sheep Crossing	Ashurst	Clear Creek	
	Woods Canyon Lake	West Fork	Forked Pine	Manzanita	
		Warren Springs	Dairy Springs	Pine Flat Trailer	
		P. S. Point	Kinnikinik	Thumb Butte	
		Beaver Dam	Blue Ridge	White Spar[4]	
		Hall	Rock Crossing	Upper Wolf Creek	
		Aspen	Cave Springs	Lower Wolf Creek	
		Elderberry	Pine Flat	Indian Creek	
		Nelson Reservoir	Granite Basin	Potato Patch	
		Jackson Springs	Chevelon Lake	The Playground	
		Hannagan	Christopher Creek	Mingus Mountain	
		Cienaga	Tonto Creek	Powel Springs	
		Stray Horse	Ponderosa	Gentry	
		Honeymoon		Canyon Point[4]	
		Red Rock		Midsley Bridge	
		Chavez Crossing		Encinoso	
		Halfway Point		Lower Manzanita	
		Banjo Bill		Sycamore	
		Slide Rock		Pine	
		Woodland Reservoir		Beaver Creek	
		Fool Hollow			
		Black Canyon Rim			
		Willow Springs Lake			
		Bear Canyon Lake			
		Chevelon Crossing			
Aggregate Values					
Nondiscriminating Monopolist Value	$ 4,833,270	$ 7,846,791	$ 5,750,080	$1,812,132	$20,242,273
Consumer Surplus Value	$11,117,539	$22,399,977	$14,649,750	$3,517,052	$51,684,318

[1]United States Department of Agriculture, Forest Service (n.d.)

[2]Excludes southern portion of the Tonto National Forest and Indian Lands. See Table 20.

[3]Two times the value of the representative site.

[4]Three times the value of the representative site.

[5]Four times the value of the reprensentative site.

of data, one starting with aggregates and purporting to look at all recreational use, the other starting with a few representative sites and projecting values for these sites to the entire Basin, lends credence to either set.

Conclusions

Demand functions and value estimates for representative sites in the Salt-Verde Basin as well as values for the entire Basin have been presented. Knowing the values of these forest lands for recreation use, as well as having values for the other products produced by these forest lands could allow the U.S. Forest Service to more efficiently administer this Basin as outlined in the Multiple Use Sustained Yield Act of 1960. It is recognized that economics of recreation research is still in the stage of infancy, and that the estimates presented are merely "ball park estimates." Yet, until more conceptual and empirical works are done, these estimates along with those of Martin, Gum, and Smith (1974), Kurtz (1972), and King and Kurtz (1968) are the best available for Arizona and should have applicability in terms of magnitudes of value for particular types of sites throughout the Southwest.

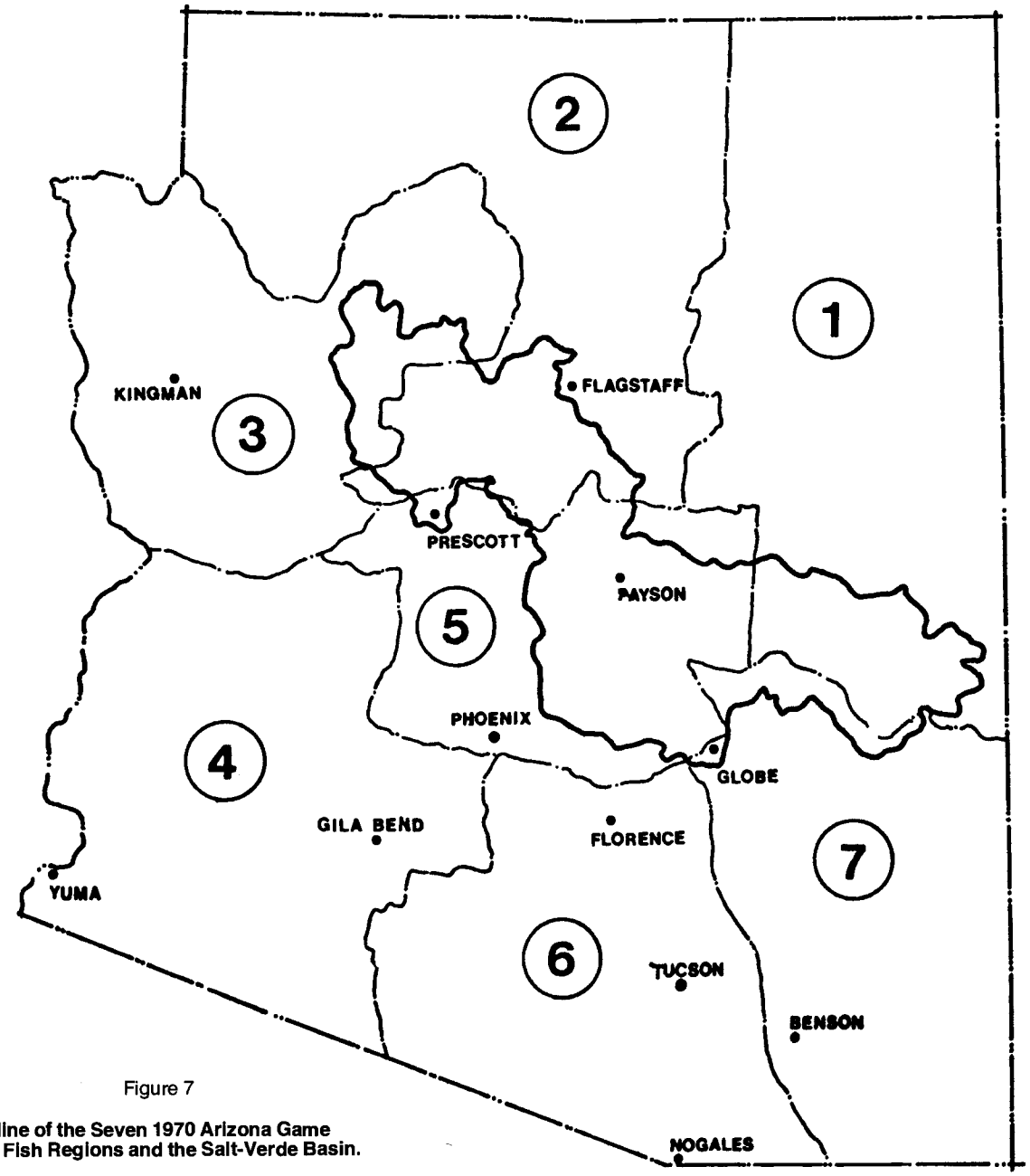

Figure 7

Outline of the Seven 1970 Arizona Game and Fish Regions and the Salt-Verde Basin.

TABLE 18

Consumer Surplus Value of Portions of the Arizona Game and Fish Regions within the Salt-Verde Basin, 1972.[1]

Region	General Rural Outdoor Recreation ($)	Cold Water Fishing ($)	Warm Water Fishing ($)	Total ($)
1	8,383,701	5,738,558	348,695	14,470,954
2	15,221,026	1,367,129	181,127	16,769,282
3	665,655	221,429	902,456	1,789,540
5	15,528,911	471,636	11,666,061	27,666,608
7	1,029,207	157,642	392,777	1,579,626
TOTAL	40,828,500	7,956,394	1[illegible],116	62,276,010

Source: Martin, Gum and Smith (1974)

[1]Data inflated from 1970 to 1972. See Figure 7 for Region and Basin boundaries.

TABLE 19

Nondiscriminating Monopolist Value of Portions of the Arizona Game and Fish Regions Within the Salt-Verde Basin, 1972.[1]

Region	General Rural Outdoor Recreation ($)	Cold Water Fishing ($)	Warm Water Fishing ($)	Total ($)
1	5,278,050	3,466,216	204,796	8,949,062
2	8,978,015	737,991	112,250	9,828,256
3	399,070	138,814	643,049	1,180,933
5	9,000,037	200,036	7,357,875	16,557,948
7	499,808	102,308	193,811	795,927
TOTAL	24,154,980	4,645,365	8,511,781	37,312,126

Source: Martin, Gum and Smith (1974).

[1]Data inflated from 1970 to 1972. See Figure 7 for Region and Basin boundaries.

TABLE 20

Comparison by Sources of Total Value Estimates for the Salt-Verde Basin, 1972.

Type of Estimate	Nondiscriminating Monopolist Value ($)	Consumer Surplus Value ($)
Total Estimates for Basin Using Representative Sites		
Aggregate of Representative Sites[1]	20,242,273	51,684,318
Southeast Portion of Region 5[2]	8,178,868	13,597,485
Indian Reservations[3]	7,955,346	13,156,390
TOTAL	36,376,487	78,438,193
Total Estimates for Basin from Martin, Gum, and Smith (1974) (Excluding Hunting)[4]	37,312,126	62,276,010
Total Estimates for Basin for Hunting[5]	4,153,537	9,158,868

[1]See Table 17.

[2]Warm water lake area near Phoenix including Roosevelt, Saguaro, Apache, and Canyon Lake for warm water fishing and general rural outdoor recreation.

[3]Portions of Fort Apache and San Carlos Indian Reservations within the Salt-Verde Basin outside of National Forest boundaries and within Arizona Game and Fish Regions 5 and 7.

[4]See Tables 18 and 19.

[5]See Tables 21 and 22.

TABLE 21

Nondiscriminating Monopolist Value for Hunting of Portions of the Arizona Game and Fish Regions within the Salt-Verde Basin, 1972.[1]

Region	Deer Hunting ($)	Other Big Game Hunting ($)	Small Game Hunting ($)	Water Fowl Hunting ($)	General Hunting ($)	Total ($)
1	93,723	130,761	12,313	6,541	12,935	256,273
2	390,702	126,813	58,657	3,029	5,302	584,503
3	21,717		12,242		970	34,929
5	85,586	655,116	2,108,344		63,803	2,912,849
7	136,406	19,719	191,728	8,579	8,551	364,983
TOTAL	728,134	932,409	2,383,284	18,149	91,561	4,153,537

Source: Martin, Gum and Smith (1974).

[1]Data inflated from 1970 to 1972. See Figure 7 for Region and Basin boundaries.

TABLE 22

Consumer Surplus Value for Hunting of Portions of the Arizona Game and Fish Regions within the Salt-Verde Basin, 1972.[1]

Region	Deer Hunting ($)	Other Big Game Hunting ($)	Small Game Hunting ($)	Water Fowl Hunting ($)	General Hunting ($)	Total ($)
1	201,503	513,128	28,250	14,132	26,034	783,047
2	1,417,044	282,954	139,740	7,689	13,376	1,860,803
3	48,988	6,080	23,909	5,461	2,837	87,275
5	280,322	1,149,165	3,805,057	41,554	192,731	5,468,829
7	348,265	50,386	375,744	20,701	163,818	958,914
TOTAL	2,296,122	2,001,713	4,372,700	89,537	398,796	9,158,868

Source: Martin, Gum and Smith (1974).

[1]Data inflated from 1970 to 1972. See Figure 7 for Region and Basin boundaries.

APPENDIX A
Details of the Estimation Process

The general method of this research was an adaptation of the Clawson (1959)-Hotelling (1949) approach to estimating the demand for and value of outdoor recreation as described in a general conceptual manner in the text. This appendix focuses on details of the specific estimation process.

Research Design

The Salt-Verde Basin extends from the central part of Arizona almost to the New Mexico border. It is eight million acres in size and one of the primary supply areas for people pursuing outdoor recreation in Arizona. The U.S. Forest Service administers 63 percent of the total Basin and a larger proportion of the upstream watersheds. Developed recreation sites occupy 2,276 acres of the total forest land in the Basin.

It is not feasible to study each of the sites within the eight million acre Basin. Therefore, the concept of the "representative site," similar to the widely used economic concept of the "representative farm" or "representative firm" was adopted. Each representative outdoor recreation site may be viewed as a stand-in for similar sites within the Basin.

The number of sites selected for study was constrained by the available time of the researcher and the size of the Forest Service grant of funds which provided the major support for this project. Due to these constraints, all types of sites may not be represented. However, an effort was made to select a variety of sites with respect to vegetative types, recreational activities and location relative to major population centers.

Five sites were selected for study. All are in relatively remote areas. All but one of the sites can be reached only by traveling on dirt roads. Access to the sites is limited. The purpose of selecting sites with limited access was to better monitor the number of visitors to the specific sites. One site from each National Forest within or abounding the Basin was chosen. Locations of the sites are shown in Figure 6.

In order to develop demand relationships for particular forest sites, people who have actually visited the sites must be contacted. Therefore, if questionnaires were to be sent to recreators who had visited one of the five representative sites, it was essential to obtain the names and addresses of the visitor population.

As explained above, the sites selected are all relatively remote areas with limited access (one or two dirt roads). Only some of the sites have camping facilities for which overnight campers must pay a fee and register. Therefore, no available population list existed. In order to develop a population list at each site from which to draw a sample, voluntary registration desks were placed along each access road to each site. Registration cards placed in containers attached to the registration desks requested the name, street and town address, auto license number, ZIP code, and date of registration for one member of each visiting group. Directions for filling out the card and a simple explanation of the purpose of the study were in plain view at the registration desk. Since the decision was made to view the household as the decision making unit, as did Gum *et al.* (1973) and Martin *et al.* (1974), only one member of each visiting group was asked to fill out a registration card (the questionnaire inquired as to the composition of the visiting group). The completed cards were dropped into a locked container attached to the registration desk. The cooperating ranger from each district and/or the researcher collected the completed registration cards on a weekly basis. See Figure 8 for a picture of the registration desk.

Upon receipt of the registration cards, a mail questionnaire, along with a self-addressed stamped envelope, was sent to the visitors of each site. The questionnaires were mailed as soon as possible after registration in order to reduce memory bias on the part of the recreator. He would receive the questionnaire while the recreation experience was still fresh in his mind. The questions related to the specific site at which the respondent registered.

The sites were sampled during their use season as established by the U.S. Forest Service. The season at most of the sites extends from May to October; at Brushy Basin-Four Peaks the season is year round. As shown in Table 23, 5,298 individual households registered at the five sites.

Since some of the households visited the selected sites several times during the study period and since they could register more than once at a registration booth, care was taken that only one questionnaire was sent to an individual household. Questionnaires were mailed to all individual households that registered at the five selected sites. One week after the questionnaire was mailed, a follow-up letter was sent to the registrant, the purpose of which was to thank the person for his response and to remind him that if he had not responded to please do so.

Figure 8

A Registration Desk.

Questionnaire Design and Response of Recreators

A mail interview questionnaire was selected due to the large number of questionnaires to be completed for each of the five sites. The total cost of the questionnaires was $2,500, approximately fifty cents per questionnaire inclusive of paper, reproductive, envelopes, postage, and labor. The same questionnaire was used for each of the five selected sites with the exception of the section that pertained to recreators' attitudes toward the specific site. The cover letter contained the name of the specific site at which the recreator registered.

The rate of response to the questionnaire, as shown in Table 23, ranged from a low of 45.8 percent at Black Canyon Lake to a high of 54.5 percent at Horsethief Basin. Not all of the questionnaires that were returned could be used in the analysis since some were incomplete. The rates for usable questionnaires ranged from a low of 39.8 percent at Luna Lake to a high of 52.9 percent at Horsethief Basin. These rates of return are considered quite high when taking into account the length and complexity of the 12-page questionnaire.

No adjustments were made for possible bias due to nonresponse. Since in the regression analysis the coefficients on the socioeconomic characteristics of households at all sites except at Luna Lake were not stable nor significant, it was judged that the additional time and cost of contracting the nonrespondents was not justified. The coefficients on cost and distance variables were significant and stable, enabling demand estimates to be made. Since the hypothesized shifter variables were not usually significant, further data on these variables from the nonrespondents would not serve as a basis for adjusting any bias. ("Stability" means that the coefficient has the same value in a number of alternative formulations of the model indicating that, at least with respect to the variable in question, the effect of that variable is being estimated with little bias.)

Definition of Variables Necessary in Constructing the Demand Curve

It was theorized that the variable costs that a recreationist incurs are the major determinants of the number of trips and/or days a household participates in recreation at a site. These variables are defined specifically below.

The Quantity Variable

Most recreation literature has defined the amount of recreation taken in terms of user-days or user-trips per unit of population. As a result, researchers have normally worked with average trips or average days per capita from a given area to a recreation site. In addition, most of the literature has been concerned with developing information pertaining to the participation and ex-

TABLE 23

Summary of Response to Questionnaires, by Sites.

Site	Questionnaires Mailed	Questionnaires Returned[1]	Percent of Questionnaires Returned[2]	Usable Questionnaires[1]	Percent Usable Questionnaires[2]
Luna Lake	1,134	566	49.9	451	39.8
Black Canyon Lake	854	391	45.8	360	42.2
Knoll Lake	1,456	786	54.0	662	45.5
Horsethief Basin	554	302	54.5	293	52.9
Brushy Basin-Four Peaks	1,300	650	50.0	634	48.8
TOTAL	5,298	2,695	50.9	2,400	45.3

[1] Of the returned questionnaires, 89 percent were usable.

[2] Expressed as a percent of questionnaires mailed.

penditures of individuals or individual licensed sportsmen in their outdoor recreation activity. Neither approach is adhered to in this study.

The authors are convinced that the family is the decision making unit and that the household is the meaningful recreation unit to observe. Therefore, rather than developing information about individuals or individual licensed sportsmen, information is developed about households. (See page 19 of text.)

The average trip per capita method for computing the quantity variable is replaced by the more efficient individual observation method as described by Brown and Nawas (1971, 1973) and Martin, Gum and Smith (1974). The quantity variable was computed in terms of both household-trips and household-days. The number of trips and days taken in 1972 by the sample households to each specific site was requested in the questionnaires. These numbers were related to data specific to the individual household in the regression analysis. Household-trips was not successful as a dependent variable. Therefore, only data on household-days is reported in the text.

In the second stage of the analysis, the demand curve was computed for each individual household and then expanded by the appropriate sampling rate to arrive at the estimated days that the aggregate of households would take at alternative additional costs.

The Price Variable

To complete the demand relationship, the price variable must be defined. This variable consists of expenditures incurred by a household while participating in an outdoor recreation activity. These are expenditures which are incurred only if the trip is made. These variable expenditures must be considered by households when planning a trip and may, therefore, determine the number of trips undertaken. Expenditures that occur whether a trip is made or not are considered "fixed" in nature and are usually on items that are usable over a long period of time and, therefore, not directly associated with a particular recreation trip or activity. As a result, they are not useful in estimating the value of the recreation resource itself. The categories that comprise the variable expenditures in this study are as follows:

Additional food and refreshment costs including liquor (only the cost of food and refreshment above that which would have been spent at home is included).

Lodging (motels, hotels, trailer courts and camp fees; excluding camping equipment, staying with friends or relatives, or at own cabin).

Transportation (gasoline, oil, bus fare, air fare, etc.; excluding the cost of insurance, depreciation, and other items of a fixed nature).

Other Costs (ammunition, camera film, live bait, rental of equipment, license fees if only for this one trip, etc.; any items that could have been utilized on more than one trip were excluded).

Food expenditures presented a minor problem since they are legitimate on-site expenditures but also take place regardless of whether a recreation activity is undertaken or not. Consequently, expenditures for food and refreshments per trip consisted of those outlays that represented additional expenditures above the amount that the member(s) of a household who went on a trip would have spent at home on these items for the same time period. The amount that households would have spent at home was computed on a standarized cost per day per person basis according to family size and income. Computations were made in terms of 1972 dollars from data contained in a report by the U.S. Department of Agriculture, Agricultural Research Service (1968). The difference in food expenditure between at home and on the trip could be either positive or negative.

Transportation expenditures for passenger vehicles were computed on the basis of estimated average variable roundtrip transportation costs per mile from the origin of the trip to the recreation site plus additional on-site travel. The variable transportation costs included the cost of gasoline, oil, repairs, tires, taxes, and fees. As per the U.S. Department of Commerce (1971), a weighted average of 5.2 cents per mile was calculated. For ease of computation, and since mileage could not be estimated to decimal points, an even five cents per mile was used in the computations. If transportation expenses were shared with others in the recreating group, then only that percent paid by the respondent was included.

Methods for Estimating the Number of Households at a Site and the Response Rate

To determine the total number of days or trips per year taken by households to a particular site at alternative added costs, the sample household-trips or days must be expanded by the appropriate response rate. The response rates can only be computed if the total number of households that went to each of the sites during the study year are known. Several alternative methods were used to develop the estimate of total household use in 1972 as described below. In each case, the number of household-trips were first estimated. Then, the trip estimates were reduced to estimates of the participation of individual households since some households made more than one trip.

Traffic Counters

Traffic counters were installed at the entrances to four of the sites. Traffic counters record the number of axles that cross the entrance to a site. Thus, traffic counts were divided by two to arrive at vehicle counts since most vehicles have two axles—although an unknown number were pulling trailers. Three of the four sites at which counters were installed had only one entrance, therefore, vehicles left the site over the same traffic counter as they entered the site. Thus, to arrive at the number of household-visits, the vehicle counts were

divided by two. It was assumed that each vehicle that crossed the traffic counter was a household unit.

At the sites where the Forest Service had installed traffic counters, counts were recorded by the Forest Service on a daily basis during the recreation season. At Brushy Basin-Four Peaks where the researcher installed a traffic counter, counts were taken every two weeks throughout most of the year.

The traffic counts at three of the sites may have been biased upwards, since the same vehicles could enter and leave the site several times during their visit for the purpose of purchasing supplies or visiting a nearby site. At Brushy Basin-Four Peaks, where the count was not recorded each day, problems with the counters probably gave an underestimate.

Visual Counts

The second method employed to estimate the number of household-trips at a site was to take a visual count of vehicles entering during a sample of several days of the recreation use season.

A researcher stationed himself near the registration booth, but out of sight of visitors to the site, and recorded the number of vehicles that entered, their license plate numbers and whether or not they registered at the registration desk. Both a weekday and a weekend day were sampled in this manner. The total count of vehicles was expanded by the number of weekend and weekdays that the site was open for recreation.

A record was also kept of the percent of vehicles that stopped at the registration desks to register. If the assumption is made that the rate of registration during the sample check remains the same throughout the remainder of the season, estimates of household-trips can be made by dividing the number of registrants for the season by the percent of registrants of the visual check. This was the third estimation technique.

RIM Double Sample

Estimates were also made from the U.S. Forest Service RIM Center double sample. Forest Service personnel sample recreation sites for a minimum of twelve days. Half of the samples are taken on weekend days and holidays, half on weekdays. Each of the sampling days consists of twelve hours, during which an observer gathers and records data at regular intervals. The figures are weighted and expanded for the entire recreation season by the Forest Service RIM Center to produce estimates of the number of visitor-days and visits (people) to a site per season.

Converting Visits to Households

In order to determine the appropriate response rate for each site, the estimated total visit data had to be converted to the estimated number of individual households making the visits.

For the traffic counter method and the visual counts method, the resulting estimates of household-trips were divided by the mean number of trips per sampled households to arrive at the total number of individual households visiting a site per season.

The RIM estimates were in terms of the number of people at a site per season. This estimate was divided by the mean number of members in a household (computed from the sample data) to arrive at household-visits. These household-visits were then divided by the mean number of visits per sample households to arrive at the total number of households visiting a site per season.

Table 24 shows the resulting household estimates at the five representative study sites, using the alternative methods, and the mean estimate of the four methods employed. The mean of the four methods employed for estimating households was used since no single estimate was considered "most reliable." At Horsethief Basin, traffic counts grossly overestimated households because vehicles entered and left the site several times during the day. At Knoll Lake traffic counts also overestimated households because many households drove their vehicles from the campground to the lake and back. At Horsethief Basin, Knoll Lake, and Luna Lake the RIM double sample estimates were rated by the U.S. Forest Service as not very reliable. The visual counts cannot be considered extremely accurate since only two days out of the entire recreation season were sampled.

The response rates listed in Table 24 were computed as the number of usable returned questionnaires divided by the mean estimated number of households visiting the site. These rates are used to expand the sample trips and days made by households during a recreation season.

The Statistical Demand Models

Demand estimates express the relationship between quantities demanded and various prices of goods. The individual demand functions for outdoor recreation involve similar relationships using the substitute variables described earlier. The resulting second-stage function expresses the willingness on the part of the recreationist to pay for the use of a recreation site.

Stepwise multiple regression analysis was used to derive the statistical demand estimates. Regression analysis fits a curve to data points minimizing the sum of errors squared where error is defined as the difference between the observed and predicted values of the dependent variable. The general form of the function used may be stated as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6)$$

where:

- Y = estimated number of household-trips or days to a site by an individual household in 1972
- X_1 = variable costs per visit or per day, depending on the definition of Y
- X_2 = average roundtrip mileage from point of origin to site plus on-site mileage
- X_3 = age of head of household

TABLE 24

Number of Households at Selected Recreation Sites During 1972 Using Different Estimating Techniques, and the Resulting Response Rate.

Recreation Sites	Household Estimates Using Different Techniques					Response Rates
	RIM Center Technique	Traffic Counts	Visual Count	Visual Count Percent Registered	Mean[1]	
Luna Lake	6,200	([2])	6,700	5,700	6,200	.0727
Black Canyon Lake	4,000	3,600	3,900	4,000	3,900	.0923
Knoll Lake	3,900	4,700	4,200	4,000	4,200	.1576
Horsethief Basin	3,800	([3])	1,900	1,800	2,500	.1172
Brushy Basin	([4])	1,700	1,700	2,800	2,100	.3019

[1]Rounded to nearest hundred.

[2]No traffic counters were installed at site.

[3]Traffic counts were so inconsistent they could not be used.

[4]U.S. Forest Service did not sample this site.

X_4 = education of head of household
X_5 = household income per year
X_6 = number of days of paid vacation of head of household

Several alternative equation forms were tested in order to achieve the best fit. In all cases, a quadratic form of the equation gave the best fit and was used for evaluation purposes. Thus, the regression equation used was as follows:

$$Y = a + b_1X_1 + b_2X_1^2 + b_3X_2 + b_4X_2^2 + b_5X_3 + b_6X_3^2 + b_7X_4 + b_8X_4^2 + b_9X_5 + b_{10}X_5^2 + b_{11}X_6 + b_{12}X_6^2$$

Where:

a is the regression constant
b_i are the regression coefficients
X_i are as defined above

Results of the regression analyses for those equations selected as "best" and used in the evaluation process are summarized in Table 25. (Results for Brushy Basin-Four Peaks are discussed separately.)

The most important independent variable from the viewpoint of using the two-stage Clawson-Hotelling estimating procedure is the average cost per trip (X_{1t}) or per day (X_{1d}) for a household to a particular site. The cost variable is crucial to the second stage of the analysis when net economic values for the resource are estimated. Added costs beyond the variable trip expenses may be interpreted as an entry fee to a site for the expressed purpose of carrying on a particular recreation activity.

The nonmonetary costs of distance traveled (travel time expressed as the average roundtrip mileage from point of origin to site) have also been hypothesized to be important demand shifters. Exclusion of these distance costs could result in an underestimate of value for a particular recreation site as pointed out by Knetsch (1963) and reiterated by Cesario and Knetsch (1970):

> Perhaps the most serious difficulty of the travel cost method, as it has been applied in the past, is a consistent bias in the derived demand curve. This difficulty results from the basic assumption that the disutility of overcoming distance is a function only of money cost. This assumption is not correct. The effect of distance is likely to be a function of the time involved in making the trip, as well as the monetary cost ...

Empirical results confirming the hypothesis of Cesario and Knetsch were recorded by Brown and Nawas (1971, 1973) and by Martin, Gum, and Smith (1974). Inclusion of these distance costs resulted in better specification of the model with increased explanation of the variance and had the effect of decreasing the cost coefficient and increasing the value of the resource. Therefore, visitor rates should be expressed not only as a function of money cost, but also as a function of time. Since time is a difficult variable to quantify, distance serves as a surrogate. The problem of multicollinearity normally present when including the two variables, distance and variable cost in the same equation under the standard Clawson-Hotelling model, is significantly reduced by using unaggregated data and employing the individual observation method as described by Brown and Nawas (1973).

However, this current research shows that the size and significance of the coefficient on the distance variable, and thus the effects on value, depend on two factors. First, as noted in the Martin *et al.* study (1974), where travel distances are relatively small for most visitors, distance (time) is not statistically significant. Such was the case at the Horsethief Basin and Brushy Basin-Four Peaks sites. Second, whether the regression coefficient is positive or negative depends on whether the number of trips taken or the number of days taken is the dependent variable. (Where most trips are only of a day or two in duration the two measures are essentially the same.) In situations as in this study, where only one or two trips of varying numbers of days are taken by an individual household to any single site, days taken is the much better dependent variable, and the coefficient on distance is positive. That is, the farther the household lives from the recreation site, the more

TABLE 25

Regression Results For The Statistical Demand Equations Selected as "Best."

Site	Independent Variables[1]												Number of Observations	R^2
	X_1	X_1^2	X_2	X_2^2	X_3	X_3^2	X_4	X_4^2	X_5	X_5^2	X_6	X_6^2		
Luna Lake[2]	-.218967 (4.62)	.001382 (2.60)	.014862 (6.87)	-.000006 (3.67)	-.445659 (2.89)	.005806 (3.49)	-.023470 (4.17)	.071816 (3.54)	.008191 (1.54)			.000471 (2.42)	451	.28
Black Canyon Lake[3]	-.138061 (2.68)		.069722 (3.45)	-.000045 (2.31)			2.42633 (1.50)	-.101715 (1.65)			-.074593 (1.02)	.000411 (2.01)	184	.21
Knoll Lake[4]	-.044880 (5.70)	.000018 (5.66)	.004778 (3.63)	-.000002 (1.25)	-.032010 (0.91)	.000299 (0.72)		.000156 (0.17)		-.000002 (0.58)	.002085 (0.26)	-.000004 (0.43)	585	.09
Horsethief Basin[4]	-.162494 (4.07)	.004465 (3.24)	.002588 (0.40)	.000012 (.94)	-.101592 (1.90)	.001134 (1.77)							258	.13

[1]See page 30 for variable definitions. Student t values are in parenthesis beneath the regression coefficients; blank spaces indicate that additional steps in the stepwise regression to include more variables reduced the "t" values on the cost variables, affected the sign of the cost variables adversely, or did not improve the overall results significantly. The dependent variable is household-days per year. The regression constant ("a" value) is not shown since it is not used in the evaluation procedure as described in the following section.

[2]Based on the complete sample of households.

[3]Based on a sample of households that traveled a one-way distance greater than 75 miles from point of origin to site.

[4]Based on a sample of households taking eight or fewer days per year at this site.

days the household will stay at the site—given that it visits the site at all. Thus, inclusion of the distance variable tends to increase the size of the cost coefficient, and decrease the value of the resource. Inclusion of distance is, of course, an improvement in model specification. A positive, significant coefficient on the linear distance variable occurs for the Luna Lake, Knoll Lake and Black Canyon Lake sites when household-days is the dependent variable.

Variables X_3 to X_6, the hypothesized socioeconomic shifter variables, were not statistically significant except at Luna Lake where it appears that the higher numbers of household-days taken per year are associated with the quite young and quite old, with lower years of education, and with larger numbers of days of paid vacation.

It is recognized that R^2 values are relatively low. However, interest was not specifically in obtaining high R^2 values but rather in the reliability of the estimated structural parameters, especially those of the cost variable from which the value of the resource itself is derived. As Brown and Nawas (1973) point out, the higher R^2 values obtained in recreation research when the observations are averaged by group are misleading since the increased correlation among several explanatory variables resulting from aggregation lead to problems of multicollinearity, which in turn leads to losses in estimating efficiency. The important thing is to obtain reliable estimates of the coefficients on variable cost.

None of the statistical demand equations exhibited a significant and negative cost coefficient for the Brushy Basin-Four Peaks area, a necessary condition in order to estimate net values using the second-stage of the Clawson-Hotelling analysis. Thus, the following alternative procedure was used in which the demand for the site itself was estimated directly.

A table consisting of the number of sample households, the number of days taken at the site per year and the household's expression of the maximum entry fee per day that they would be willing to pay was developed. At each maximum willingness to pay level, the number of households was multiplied by the corresponding number of days taken at the site per year. The responses of maximum willingness to pay were then arrayed and cumulated downward. The sample data were expanded by the appropriate blowup factor and the result was a schedule of demand relating the number of total days household units would take at this area per year to their maximum willingness to pay an entry fee into the area. Results of this schedule are shown in Table 26. When these data were subjected to multiple regression analysis, the following equation was obtained:

$$Y_D = 6163 - \underset{(9.10)}{1817.50X_1} + \underset{(6.80)}{124.86X_1^2}$$

$R^2 = 88$

Y_D = estimated days per year

X_1 = willingness to pay

Figure 9 depicts the scatter of points, the estimated least squares regression curve, and a freehand curve fit to the same data. The consumer surplus value can be determined directly, either as the integral under the regression demand curve or as the area under the freehand curve.

TABLE 26

Schedule of Willingness to Pay and Associated Number of Days Taken by Households at Brushy Basin-Four Peaks in 1972.

Willingness to Pay (Dollars Per Day)	Total Household Days Per Year
0	8,195
.50	5,489
1.00	4,574
1.50	2,395
2.00	2,242
2.50	1,239
3.00	1,113
3.50	749
4.00	749
4.50	735
5.00	735
5.50	119
6.00	116
6.50	116
7.00	116
7.50	116
8.00	43
8.50	43
9.00	43
9.50	43
10.00	43
10.50	7

The curve developed by least squares regression does not fully describe the demand relationship in that the curve meets the "willingness to pay" axis at $5.50 rather than at $11.00 and the "days" axis at 6,163 days rather than at total estimated days of 8,195 at zero added cost. The area under the freehand curve was evaluated mechanically. Values reported are based on the freehand demand curve for the site.

These values are extremely low when compared to the variable expenditures that were incurred by households visiting Brushy Basin in 1972 and when compared to the values obtained for the other selected representative sites. It is recognized that in using this method for valuing a resource, respondents to the willingness to pay questions may understate their demand for the resource in order to avoid the possibility of high entry fees. The maximum willingness to pay price did not exceed $10.50, whereas the maximum price surrogate used with the Clawson-Hotelling approach to valuing resources exceeded two hundred dollars for some of

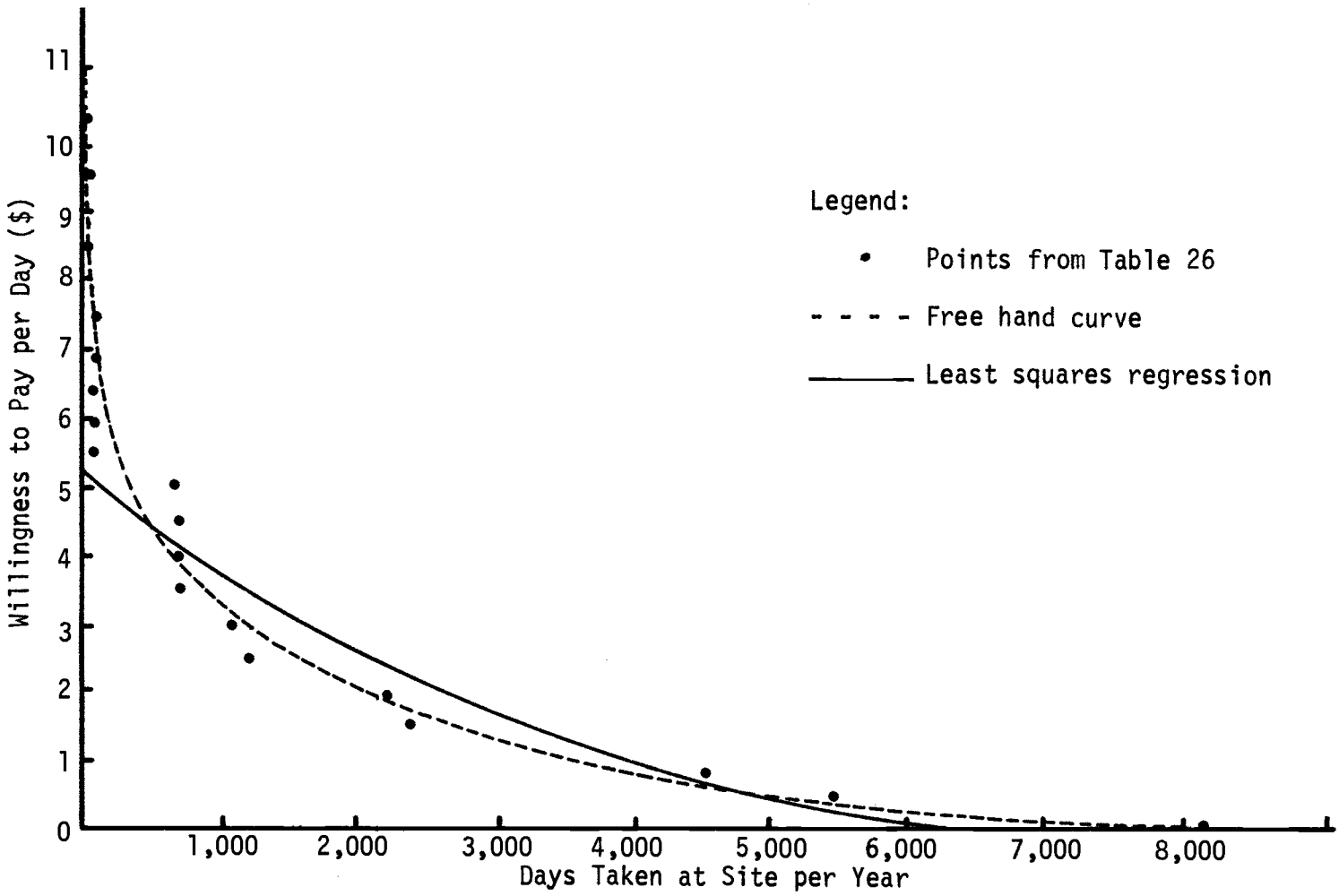

Figure 9

Regression Equation and Free Hand Curve for Willingness to Pay and Days Taken per Year at Brush Basin-Four Peaks, 1972.

the other sites. Therefore, the values derived for Brushy Basin-Four Peaks by way of the "direct" approach must be assumed to be minimum values.

Evaluation of the Sites

In the second half of the Clawson-Hotelling approach to recreation demand (used for all sites except Brushy Basin-Four Peaks), the statistical demand curve (which describes the demand for the total recreation experience) is used to estimate a second demand curve which describes demand for the specific resource or activity itself. The computerized computations for evaluating each site were done in a manner similar to the method employed by Martin, Gum, and Smith (1974).

1. An individual demand curve was estimated for each household using that household's observed number of days as the maximum that this household would take at zero additional cost. The estimated days are determined by subtracting the change in days that would be taken as a result of increased costs from the actual days taken to a site per year. The decrease in days was estimated as costs increased, until estimated days either became zero or started increasing. (The estimate would begin increasing in certain cases where the statistical demand curve reached a minimum before touching the cost axis. Since an increase in activity in response to increased cost is not logical, estimated activity was set at zero if the minimum point was reached before estimated activity reached zero.)

Only the two regression coefficients on cost are utilized—thus, the emphasis on eliminating specification bias in developing the statistical demand equation. All independent variables other than the two cost variables are ignored since the effects of

these shifter variables are included by computing individual demand functions starting with actual days at zero added cost.

In short,

$$\text{Estimated days} = \text{Actual days} - \text{change in days}$$

$$\text{Change in days} = -b_1(\text{added cost}) - 2b_2(\text{original cost} \times \text{added cost}) - b_2^2(\text{added cost})$$

Where:

b_1 is the coefficient on cost
b_2 is the coefficient on $(\text{cost})^2$
added cost = \$1, 2, 3, ..., 1,000
original cost = actual cost per day for each individual household

2. After new demand curves were estimated for each sampled household, the estimates were expanded by the relevant response rate and aggregated.

3. Via the computer program, the aggregate number of days, the associated total revenue (days times added cost), and the cumulative sum of estimated days were estimated and printed out at each level of added cost.

4. From the print-out, the nondiscriminating monopolist value (the maximum total revenue and its corresponding added cost) was selected by inspection.

5. The consumer surplus value was the cumulative sum of estimated days because days were estimated for every additional dollar of added cost until total estimated days reached zero.

Reliability of the Value Estimates

The estimates of value for the representative sites depend on the reliability of the two regression coefficients, b_1 (on variable cost) and b_2 (on variable cost squared). Table 25 reports the regression coefficients used and their associated "t" values. In general, a "t" value of 2.0 or higher indicates that the regression coefficient is "highly significant," that is, it is unlikely to actually be equal to zero. Coefficients used in computing values had "t" values ranging from 2.6 to 5.7. The standard error of each coefficient is not reported, but may be easily computed as

$$\text{standard error (se)} = \frac{\text{coefficient}}{\text{"t" value}}$$

The nondiscriminating monopolist value estimates are computed as the maximum possible size of added cost times visits as estimated from the aggregate demand curve, which in turn, was estimated as the sum of the individual demand curves. The range on the "expected value" of the nondiscriminating monopolist value estimate may be computed as derived in Martin, Gum, and Smith (1974) as follows:

> For the simple linear demand function (Black Canyon Lake), an assumption of one standard error leads to a range in the estimated nondiscriminating monopolist or consumer surplus value of between

$$\frac{b_1}{b_1 + se} \cdot (\text{reported value}) \text{ to } \frac{b_1}{b_1 - se} \cdot (\text{reported value}).$$

The difference between the lower possible value and the estimated value will always be less than the difference between the higher possible value and the estimated value.

In the more general case, where the individual demand curves are curvilinear, the range and distribution of the values computed from the aggregate demand curve can be established exactly only by numerical methods. However, as argued by Martin *et al.*, a reasonable approximation of the possible range in value may be obtained by ignoring the squared term and estimating the range as in the simple case.

APPENDIX B

Visitor Response to Components of the Whole Recreation Experience

According to Clawson (Clawson and Knetsch, 1966) the concept of the use of a recreation site is but one part of the "whole recreation experience." He maintains that the following five phases are present in every major outdoor recreation activity:

1. Anticipation and preparation for the trip
2. Travel to the site
3. The actual on-site experience
4. Travel back home from the site
5. Recollection of the experience

Thus, to derive a truly unbiased estimate of the demand function for a site itself, and the value of the site itself, a recreator would have to enjoy the experience at the site, the anticipation and recollection of the experience at the site itself, and be indifferent to all other components of the whole recreation experience. For example, if one of the other components such as travel to the site is enjoyable, the estimated demand function for the site itself will be biased upward.

In each aspect of this study, the authors have attempted to choose the assumption or the procedure which would lead to minimum, conservative estimates of value, if a choice in assumptions or procedures were available and one choice was not obviously better than the others. With this problem about the enjoyment of the various portions of the total experience, only one practical choice was available—assume indifference to components of the experience related other than to the site. As the following discussion discloses, this assumption introduces some upward bias.

An attempt was made to determine whether satisfaction was gained or lost in each component of the recreation experience by asking visitors to a site whether they enjoyed, were indifferent to, or disliked any part of the whole recreation experience. In answering these questions, recreators were asked to exclude any unusual experiences such as accidents that would bias their answers.

Tables 27 through 31 are the responses by the sampled recreators to the components of the whole recreation experience associated with each site.

Almost 88 percent of the respondents from Luna Lake indicated that planning and anticipation of the trip was enjoyable. This is the highest response of all the sites and may be due to the greater distance that this site is away from the major population centers as compared to the other sites. Brushy Basin-Four Peaks, which is closest of all the sites to the Phoenix metropolitan area has the lowest percent (80) of respondents indicating that planning and anticipation of the trip was enjoyable. Usually very little planning is required on a one-day outing such as normally undertaken when visiting Brushy Basin-Four Peaks.

Almost 92 percent of the sampled recreators at Luna Lake indicated that travel to the site was enjoyable. This again is the highest response of all the respondents of the selected sites and seems to reflect that the greater the distance and the better the road conditions are, the more enjoyable travel is. Horsethief Basin, a site close to the Phoenix metropolitan area but with a rough and dusty 30 miles of unpaved road to be traversed prior to reaching the site, had the lowest percent of respondents indicating that travel to the site was enjoyable (76 percent).

Response to an enjoyable on-site experience was highest at Brushy Basin-Four Peaks. Ninety seven percent of the registrants indicated that they enjoyed the recreation experience. Slightly over 3 percent of the visitors to Luna Lake, Black Canyon Lake, and Knoll Lake indicated that the on-site experience was unenjoyable. Much of this feeling was attributed to overcrowding at the site.

Over 82 percent of the visitors to Luna Lake indicated that the return trip was enjoyable. Only 68 percent of the households visiting Horsethief Basin stated that they enjoyed the return travel. Again the rough road conditions at Horsethief Basin are probably the reason. In fact, almost 16 percent of the households indicated that return travel was unenjoyable. A lower percentage of visitors to each of the five sites stated the return trip was enjoyable than said that travel to the site was enjoyable.

Households visiting Luna Lake and Brushy Basin-Four Peaks responded highest to enjoying the recall of the recreation experience. Almost 91 percent of those visiting Brushy Basin-Four Peaks enjoyed recalling the recreation experience. The lowest percent of sampled households indicating they enjoyed the recall of the recreation experience was recorded for Black Canyon Lake (85 percent).

From the sampled households at all the sites, it is evident that the majority of the households found all five

components of the whole recreation experience enjoyable. These results lead to the conclusion that the estimated demand functions for all five of the selected representative sites are biased upwards and therefore the estimated resource values may be somewhat high. One might make a qualitative judgment that the value at Luna Lake might be the most overestimated. The percentage of respondents enjoying the travel to the site was the highest, and enjoyment of the site itself was about the lowest. Thus, for many, it was the trip itself that was important and the households might not respond as projected to an increase in fee at the specific site.

One could posit that the estimated values for Horsethief Basin might be the least overestimated. Travel to and from the site was unenjoyable or at least not enjoyable for 23.9 percent and 31.4 percent of the households, respectively. If a person returns to Horsethief Basin, he really must enjoy the site itself.

No attempt was made to empirically measure the bias introduced into estimating the demand functions when components of the recreation experience other than the on-site experience and the anticipation and recall of the site itself were either enjoyable or unenjoyable. This aspect of recreation valuation has not been treated empirically by any author and is recommended for future studies.

TABLE 27

Visitor Response to Components of the Whole Recreation Experience at Luna Lake, 1972

Responses—Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	87.6	91.8	90.9	82.3	90.7
Indifferent	11.1	6.9	6.0	12.4	8.0
Unenjoyable	1.3	1.3	3.1	5.3	1.3
TOTAL	100.0	100.0	100.0	100.0	100.0

TABLE 28

Visitor Response to Components of the Whole Recreation Experience at Black Canyon Lake, 1972.

Responses—Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	81.4	86.7	90.8	75.8	85.5
Indifferent	18.1	11.1	6.1	17.8	12.5
Unenjoyable	.5	2.2	3.1	6.4	2.0
TOTAL	100.0	100.0	100.0	100.0	100.0

TABLE 29

Visitor Response to Components of the Whole Recreation Experience at Knoll Lake, 1972.

Responses—Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	86.1	87.8	92.9	73.4	88.4
Indifferent	12.7	8.6	3.5	17.4	9.8
Unenjoyable	1.2	3.6	3.6	9.2	1.8
TOTAL	100.0	100.0	100.0	100.0	100.0

TABLE 30

Visitor Response to Components of the Whole Recreation Experience at Horsethief Basin, 1972.

Responses—Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	85.3	76.1	94.5	68.8	89.1
Indifferent	13.3	10.9	3.8	15.6	9.2
Unenjoyable	1.4	13.0	1.7	15.6	1.7
TOTAL	100.0	100.0	100.0	100.0	100.0

TABLE 31

Visitor Response to Components of the Whole Recreation Experience at Brushy Basin-Four Peaks, 1972.

Responses—Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	80.3	88.1	97.0	77.7	93.0
Indifferent	19.4	10.8	1.9	17.5	6.7
Unenjoyable	.3	1.1	1.1	4.8	.3
TOTAL	100.0	100.0	100.0	100.0	100.0

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