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Agricultural Experiment Station
The University of Arizona

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SUMMARY AND CONCLUSIONS

This study is an economic and social evaluation of an experimental urban lakes fishing program developed by the Arizona Department of Game and Fish. In the fall of 1977 and the spring of 1978, two lakes, one in the Phoenix metropolitan area and one in Tucson, were stocked with carp (Cyprinus carpio), Tilapia (Tilapia mossambica, Tilapia zilli), channel catfish (Ictalurus punctatus), and rainbow trout (Salmo gairdneri). A special urban lakes fishing permit was required to fish at the lakes.

The data for analysis were gathered through personal interviews made at both lakes throughout the year. A sample of 8 percent of the angler permittees was selected at random. The anglers' responses to various questions relative to their willingness-to-pay for the urban lakes fishing experience were used to develop estimates of the demand for and value of an urban lakes fishing program. Value estimates were compared to program costs in order to estimate net benefits of the experimental program and evaluate the costs and benefits of possible future continuing programs.

Economic Results

During the experimental program, 6-month urban lake fishing permits were priced at $3 for adults and $1 for juveniles under 14 years. These prices were set by Department of Game and Fish. Using the estimated demand curves, alternative permit prices were estimated that would maximize Department of Game and Fish revenues. In the Phoenix area, a price of about $3.50 was indicated for an adult permit. In the Tucson area, adults were apparently less

attracted to the urban fishing program--at least after they saw what they were receiving for their permit. In this area, a price of about $2 per adult permit would maximize revenues to the Department. For juveniles, the estimated demand curves reveal that permit prices could be increased at both lakes--a $2 per permit price is suggested. However, the estimate of possible maximum revenue is not greatly different from actual revenue collected during the 1977-78 experimental program. Raising permit prices in order to maximize Departmental revenues would decrease participation, possibly by as much as 18 percent in total and by 32 percent for juveniles. Thus, the benefits of slightly higher revenue are probably not worth the costs of reduced participation, especially in a public program aimed at juveniles, minorities and low-income families.

Total consumer benefits, including the "consumers' surplus" derived above the price actually paid, were also estimated. Consumer's surplus, roughly defined, is a measure of the additional satisfaction the consumer receives from a commodity above the price he actually pays. Under the 1977-78 program, total consumers' benefits were estimated as $28,470 in the Phoenix area and $18,126 in Tucson, for a grand total of $46,596. This total is $19,050 greater than the actual sales of $27,546. The difference is the consumers' surplus generated by the urban fishing program.

Benefits versus costs are viewed in two ways. The annual costs of a future program of the same size and quality as the experimental program could not be covered by permit sales. An annual deficit of about $13,000 would result. However, when annual costs are compared to total consumer benefits, a net benefit to the anglers of about $7,700 results. That is, provision of the program increases the aggregate net welfare of the participants by more than program costs.

Socioeconomic Results

Participation in the program by ethnic minorities is much higher than their proportion in the communities. These anglers come primarily from the lowest income areas of the two cities and travel some of the greatest distances in order to fish. Analysis of willingness-to-pay as a function of angler income and other employment related variables suggests that willingness-to-pay is inversely related to ability-to-pay. Thus, the urban fishery appears to be what economists term an "inferior good." In this case, providing an "inferior good" means providing an opportunity enjoyed by poorer people.

Most people indicated that they would be doing very little if they were not fishing at the lake. Only 5 percent indicated their alternative was working or in class. Only 2 percent would have been fishing elsewhere. Apparently, the opportunity cost of an individual's time with respect to the urban lakes program is close to zero. On the other hand, from society's viewpoint, the social benefit provided by the program may be greater than having individuals simply doing nothing.

Methodological Results

The body of this report is written for the general reader; details of the estimation process are reserved for the appendices.

Attempts were made to develop demand functions under four alternative procedures and/or data sets. The alternatives were (1) the Clawson-Hotelling travel cost approach, (2) expressed willingness-to-pay using a 5-dollar auction, (3) expressed willingness-to-pay in direct response to the question, and (4) expressed willingness-to-sell. Direct response to the question on

willingness-to-pay was most successful. The economic results reported are all based on this method.

The travel cost method, generally considered the superior recreation demand procedure, was unsuccessful since travel distances were short, variable costs were low, and the opportunity costs of time apparently were minimal. The 5-dollar auction generated higher estimates of value than did the direct question approach, but are not considered reliable. Expressed willingness-to-sell the permit under conditions where the angler could not buy another one generated the highest value estimates of all. Many anglers simply would not consider a sale; they were enjoying the experience and would not give it up. Obviously willingness-to-pay values are constrained by a person's income where willingness-to-sell values are not. Thus, willingness-to-pay is more relevant when deciding if a program could be self supporting. But for a public program aimed at juveniles, minorities, and low-income families, the high values of the program to individuals who expressed very high sales prices are surely relevant.

CHAPTER 1

THE PROBLEM

Introduction

A number of small manmade lakes have been developed in Phoenix and Tucson, Arizona by state and local agencies, mostly in conjunction with neighborhood parks. Although some of these lakes contain fish (mostly black bullhead; Ictalurus melas) and have been fished by residents holding the state fishing license, the fishing is of poor quality. In July, 1977, the Arizona Department of Game and Fish began an experimental one year program of stocking two of these urban lakes--Chaparral in Scottsdale in the Phoenix metropolitan area, and Lakeside in southeastern Tucson. In cooperation with the Department of Game and Fish, estimates of the demand for and value of urban fishing in these two areas lakes were developed as input into the decision process of whether or not to continue the program on a regular basis.

The specific objectives of this analysis were as follows:

1. Estimate demand curves for urban fishing permits. These curves show the numbers of permits that would be purchased at alternative permit prices.
2. Estimate the maximum amount of revenue the Department could earn if it chose to do so by charging an "optimum" price. In the terminology of economics, this amount is the non-discriminating monopolist value of the urban lake fishing program.

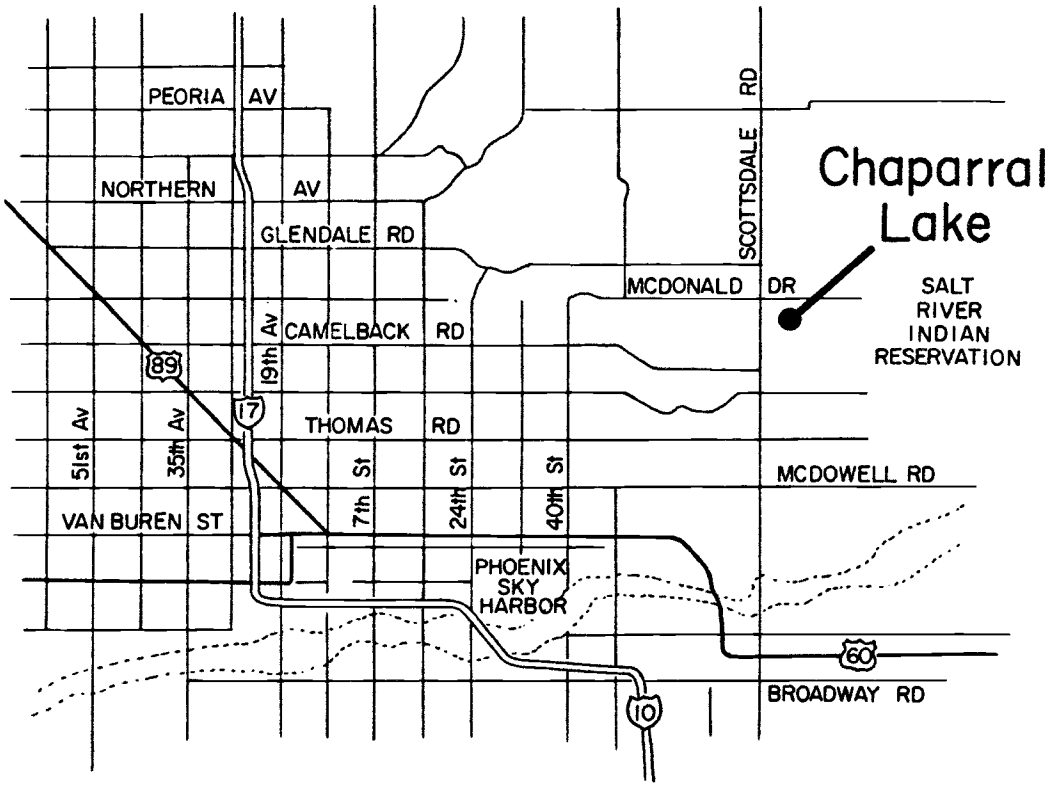

Figure 1. Chaparral Lake, Scottsdale, Arizona
(Phoenix Metropolitan Area)

3. Estimate the total benefits accruing to the urban fishing public. This total value of the fishing program is larger than the maximum revenue value, in that many people would be willing to pay higher prices for the permits than they actually did pay, if they had to. This extra value is known as the "consumers' surplus value".
4. Develop measures of net returns to the fishing program, under alternative assumptions about program costs and estimated program values.
5. Examine selected socioeconomic phenomena associated with the fishing program, such as the intensity of minority usage, patterns of angler participation, and angler attitudes.
6. Finally, draw implications for future urban fishing programs.

The body of this report focuses on the economic estimates and socioeconomic description obtained from the analysis. Details of the estimation process and methodological issues are reserved for the Appendices.

Description of the Areas Studied

Chaparral Lake, covering about 10.5 acres, is located in Scottsdale, Arizona on Hayden Road between McDonald and Chaparral Roads. It is a part of the Indian Bend Wash Greenbelt System. The median family income of the ninety-nine percent Anglo area surrounding the park is $19,000 per year. Forty-one percent of all households in the area have children under the age of eighteen (Inside Phoenix, 1978). The park itself has a variety of facilities: a stadium, a municipal pool, picnic benches, playing fields, and grass. The lake's location in the Phoenix metropolitan area is as shown in Figure 1.

Lakeside Lake, about 12 acres in size, is located in southeastern Tucson near the intersection of Pantano and Stella Roads and about 3 miles from the main gate of Davis-Monthan Air Force Base (Figure 2). The median family income of the closely surrounding area is about $17,500 per year. Forty-six percent of all households have children under the age of eighteen; over 95 percent of the population are Anglo (Tucson Trends, 1978). Park facilities include picnic tables and ramadas, a playing field for sports, a basketball court, and a playground for small children on the west bank of the lake. However, the remaining three shores of the lake have neither facilities nor grassy banks.

The Experimental Urban Fishing Program

The Arizona Department of Game and Fish regularly stocked both lakes at about 2 week intervals from July 1, 1977 to June 30, 1978. During the warm-water months--July until mid-November and again from April through June--channel catfish, carp and Tilapia were stocked. Trout were added in the cold-water months from mid-November to the end of March. Creel limits at the two lakes were 4 catfish, 6 carp, 6 Tilapia, 4 trout for adults and 2 trout for juveniles.

Since the Department of Game and Fish felt that even the experimental program should be at least partially self-supporting, a special urban fishing permit was required. The permits were good for 6-month periods, from July through December and from January through June. Adults paid $3 for a 6-month permit in addition to the regular yearly state fishing license. Children under the age of fourteen, not required to buy the state license, paid $1 for the special permit. Adults having only a state fishing license

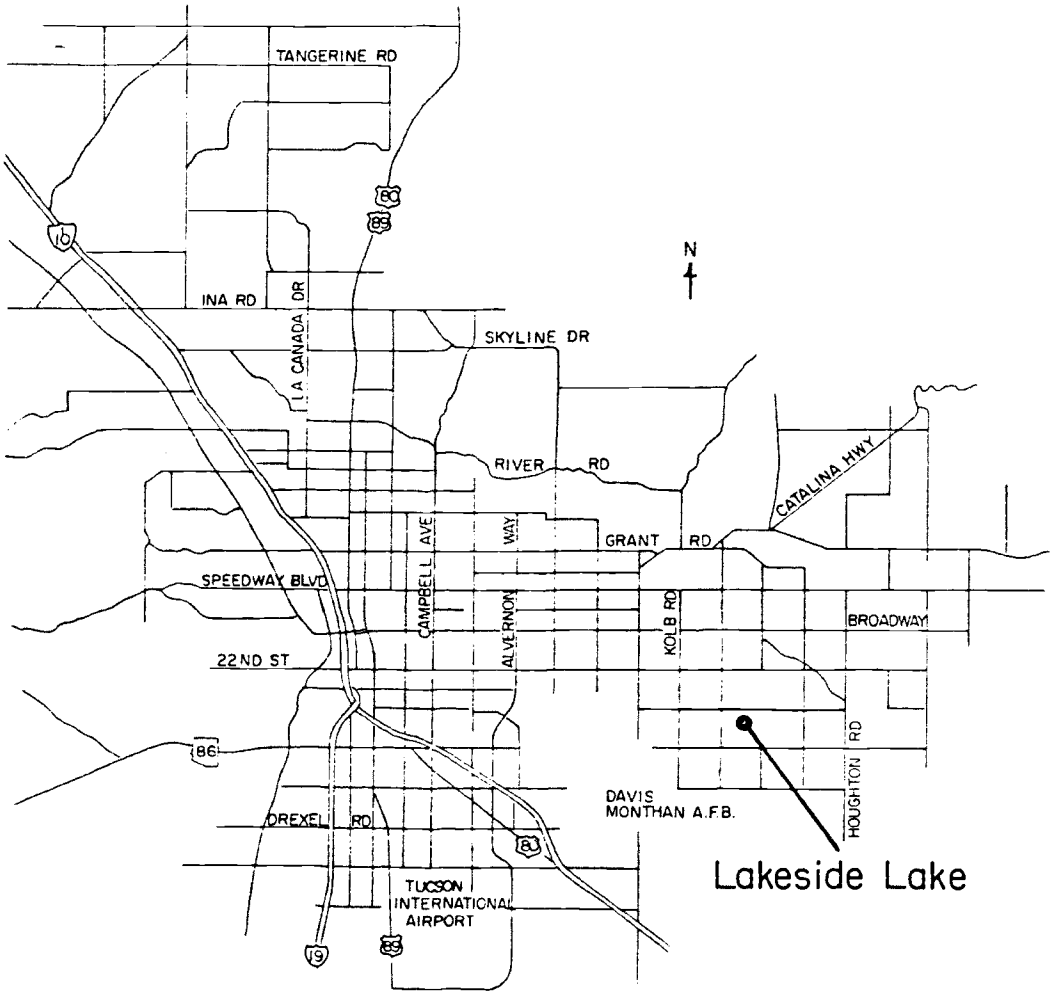

Figure 2. Lakeside Lake, Tucson, Arizona

instead of a state combination hunting and fishing license also needed to purchase a trout stamp if they wished to fish for trout. A regular state fishing license cost $5, a combination hunting and fishing license was $14, and a trout stamp was $4.50. The state licenses are for a calendar year; thus two state licenses were necessary to participate in both halves of the urban fishing program.

CHAPTER 2

THE ECONOMIC CONCEPTS

Demand

The demand curve for a specific commodity specifies the alternative quantities of the good that would be purchased at various market prices of the commodity at a given point in time, all other things being equal. Demand curves normally are negatively sloped. That is, as the price of a good falls, the quantity demanded of that good rises. Changes in price result in a movement along the demand curve. For demand curve DD in Figure 3, quantity demanded increases from Q to Q' as price drops from P to P'.

Other determinants of demand--income of the population, consumer tastes and preferences, population size, and prices of complimentary or substitute goods--influence the actual level of the demand schedule. If, for example, it becomes more fashionable to purchase a particular commodity or there is an increase in population, the entire demand curve shifts up and to the right for each price/quantity combination. At any given price, say P, the corresponding quantity demanded, Q", is greater for D'D' than for the original DD.

In this study, demand curves are estimated for each of the two lakes for each of the two 6-month periods, stratified by adults and juveniles. "P" is the price of a 6-month urban fishing permit and "Q" is the number of urban fishing permits that would be purchased at that price. The other determinants of demand are assumed to remain constant.

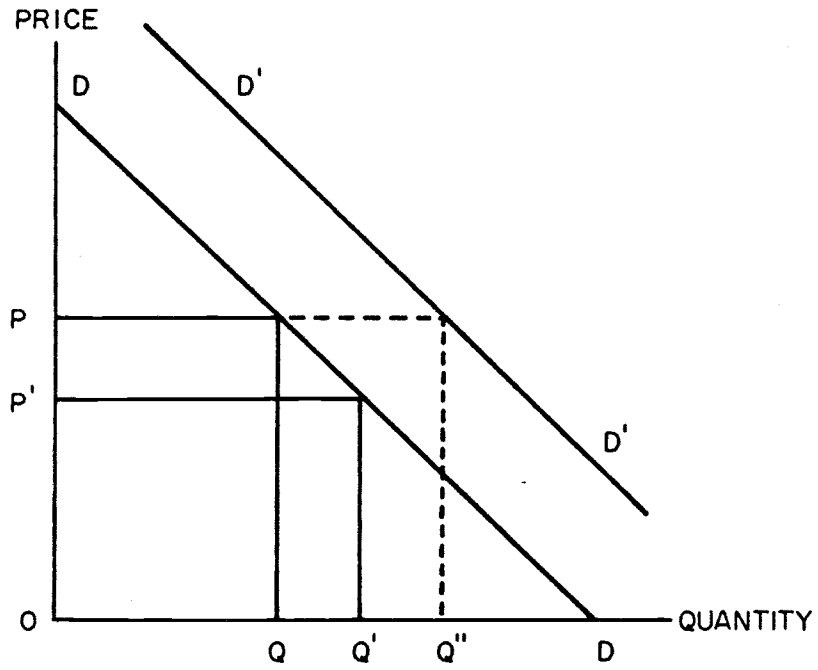

Figure 3. Demand Curves (Hypothetical)

The demand curves were estimated from data gathered by personal interview of a sample of urban anglers, where each angler was asked to state the highest price that he or she would pay for a permit. (These values are termed their "maximum willingness-to-pay" in conformance with standard economic usage.) The individual estimates within each strata were paired to the number of people willing to pay at least that amount, thereby estimating aggregate demand curves for the urban fishing permit.[1/]

Maximum Collectable Revenue

For the experimental urban fishing program, adult permits cost $3 and juvenile permits $1. However, the choice of those prices was arbitrary. If the Department of Game and Fish wishes some future ongoing program to be at least partially self-supporting, they might consider a permit price that would generate maximum revenue to the Department.

In this report, we refer to maximum collectable revenue (MCR) as that maximum revenue the Department actually could collect. The distinction is made between MCR and total consumer benefits (to be defined later), part of which is not collectable.

There is one price on any given demand curve that would generate the maximum collectable revenue for the seller. It is known as the "nondiscriminating monopolist" price because it is the price a single seller of a product (a monopolist) who does not discriminate among buyers would charge

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[1/] The number of people was expressed in percentage of the total number in the particular subsample under analysis. Thus, each curve may be easily interpreted relative to the total population to which it refers, and comparisons between curves for different strata were facilitated.

in order to maximize total revenue. Knowing the demand curve, one may find this price and its associated revenue by inspection if one computes the revenue for each price-quantity combination. Alternatively, one may solve the demand equation for that combination of P and Q which will yield an elasticity of demand (E_d) of -1.0. Elasticity of demand is defined as the percentage change in quantity resulting from a given percentage change in price. If E_d is elastic (less than -1.0), a lower price will generate more revenue. If E_d is inelastic (between 0 and -1.0), a higher price will generate more revenue. If E_d equals -1.0, revenue is at a maximum.

Total Consumer Benefits

Consumer's surplus, roughly defined, is a measure of the additional satisfaction the consumer receives from a commodity above the price he paid for it. The consumer has some idea of what he is willing to pay rather than to go without; this price must be at least as much as he does pay. The difference between the price he would pay and the price he actually does pay is called the consumer's surplus. In Figure 4, the shaded area is the sum of each consumer's surplus; that is, it is the consumers' surplus associated with a price P for Q quantity of urban fishing permits.

In this report we estimate total consumer benefits (TCB). Total consumer benefits is the sum of what consumers actually did pay plus the value of consumers' surplus. In Figure 4, TCB is the area ODAQ.

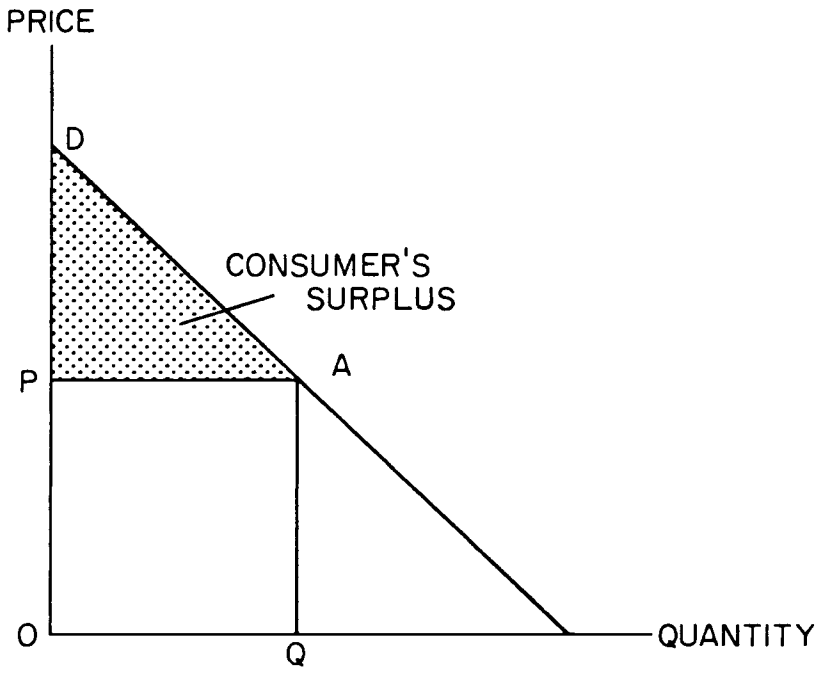

Figure 4. Consumers' Surplus

CHAPTER 3

ECONOMIC RESULTS

Participation and Revenue Collected

Total revenues to the Arizona Department of Game and Fish from selling 1977-78 urban fishing permits were $26,169 (Table 1). Permits were sold at the Department of Game and Fish, at the two city park departments, and at Yellow Front Stores near the lakes. Sellers other than the Department retained 5 percent of sales; revenues shown in Table 1 are exclusive of this amount.

Permits sold totaled 7,489 for adults and 5,026 for juveniles (Table 1). With the exception of juveniles at Chaparral, more permits were sold in 1978 than 1977 for each class of sales. However, Department of Game and Fish records show that repeat sales were only 28 percent of 1977 sales for adults and only 20 percent for juveniles.

Visits to the lakes averaged about 6.6 and 5.8 trips per permit for adults at Chaparral and Lakeside, respectively. Juveniles averaged about 7.5 trips per permit at both lakes. Total angler visits are estimated at about 76,500 for the whole year at both lakes.

Visits are probably slightly overestimated. Anglers were interviewed at the lakes throughout the entire fishing season. Interviewees were asked how many visits to the lake they had made since the date they purchased the permit. Their total trips for the season were estimated by projecting their visits at the same rate. Estimated total visits by the sample were expanded

Table 1. Total Permits Sold, and Total Revenues to the Arizona Department of Game and Fish; 1977-78 Urban Fishing Program

Lake[a]	Year	Age Group	Total Permits Sold	Game and Fish Sales	Yellow Front and City Parks Sales[b]	Total Revenue to Arizona Game and Fish[c]
				dollars		
Chaparral	1977	Adults	1,621	180.00	4,457.40	4,637.40
Chaparral	1978	Adults	2,180	312.00	5,916.60	6,228.60
Chaparral	1977	Juveniles	1,427	29.00	1,328.10	1,357.10
Chaparral	1978	Juveniles	1,383	33.00	1,282.50	1,315.50
Lakeside	1977	Adults	1,526	78.00	4,275.00	4,353.00
Lakeside	1978	Adults	2,162	132.00	6,039.15	6,171.15
Lakeside	1977	Juveniles	1,099	11.00	1,033.60	1,044.60
Lakeside	1978	Juveniles	1,117	6.00	1,055.45	1,061.45
TOTAL ADULTS			7,489			
Chaparral			3,801			
Lakeside			3,688			
TOTAL JUVENILES			5,026			
Chaparral			2,810			
Lakeside			2,216			
TOTALS			12,515	781.00	25,387.80	26,168.80

[a]Permits were statewide. However, only a few Tucson residents fished in Phoenix and vice versa.

[b]5 percent sales fee subtracted.

[c]Exclusive of minor charges for duplicate permits.

by a factor which related sample size to the total number of permits to obtain total visits for the population of urban anglers. While the rate of participation could have increased for some individuals, it is more likely that individuals interviewed in the early part of each season would have a declining rate of participation as the season continued. Obviously, the later in the season an interview was taken, the more accurate the individual projection.

The Demand Functions

Demand functions were estimated for each age group at each lake under three stocking and/or regulation conditions--the actual 1977-78 conditions and two hypothetical conditions. The willingness-to-pay levels were (1) if the 1977-78 season conditions at the lake held, (2) if the limits on the angler's favorite fish were doubled, and (3) if the lake was no longer stocked. The associated questions asked were:

(1) What is the most amount of money you would pay for your six month Urban Waters Fishing Permit rather than not fish here at all? (In addition to the regular fishing license if angler is 14 or over.)

(2) If the limit on your favorite fish were twice as high, what is the maximum amount you would pay for your six month Urban Waters Fishing Permit rather than not fish here at all?

(3) If the lake wasn't stocked, like last year, what is the maximum amount you would pay for your six month Urban Waters Fishing Permit?

The dollar amounts an angler would be willing to pay and the cumulative frequency in percentage of anglers who would be willing to pay at least that amount were tabulated by lake, year, and age group. Demand

equations were estimated by ordinary least squares. The equations and statistics measuring their reliability are presented in Appendix A. Graphs of these equations are shown in Figure 5 and 6. For example, Figure 5 shows that while 100 percent of the adults sampled at Chaparral Lake in 1977 actually paid $3 for their permit, approximately 5 percent of those sampled would be willing to pay as high as $15 for a percent under the same conditions; 50 percent would pay at least $4.50; and all would be willing to pay at least $2 for their permit.

Examination of all the curves in Figures 5 and 6 shows that there is generally a higher willingness-to-pay if the creel limits were doubled from 1977-78 conditions (even though stocking would not be increased). There is a lower, although still positive, willingness-to-pay even if the lakes were not stocked. Juveniles have lower demand curves than do adults--obviously, in general, income is a greater constraint. It also appears that both adult and juvenile anglers at Chaparral generally have a higher willingness-to-pay than do anglers at Lakeside. One might jump to the conclusion that higher incomes are again the explanatory factor since incomes of families living near Chaparral are slightly higher than those living near Lakeside. However, additional analysis, reported in a later section of this chapter, suggest that poorer anglers are willing to travel significant distances to fish at these lakes, and that they are willing to pay more for a permit than more wealthy anglers. Thus, economists would classify urban fishing as an "inferior good" where increased income actually decreases purchases.

Note that even for 1977-78 conditions, where adults had already paid $3 for the permit and juveniles had paid $1, the demand curves fall below

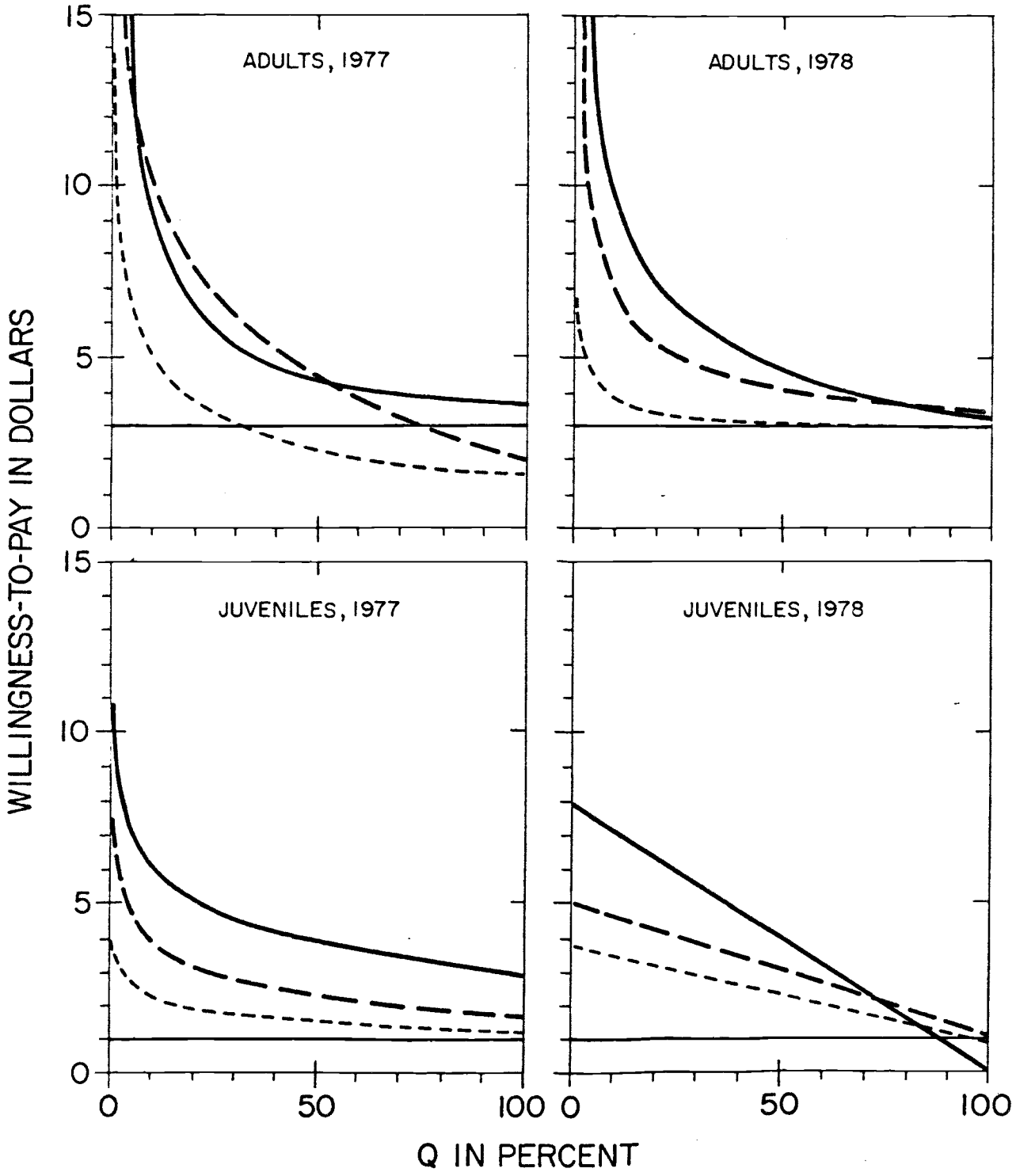

Figure 5. Willingness-to-Pay for a 6-Month Urban Fishing Permit as a Function of the Cumulative Frequency of Anglers Surveyed Willing to Pay at Least That Amount; Chaparral Lake

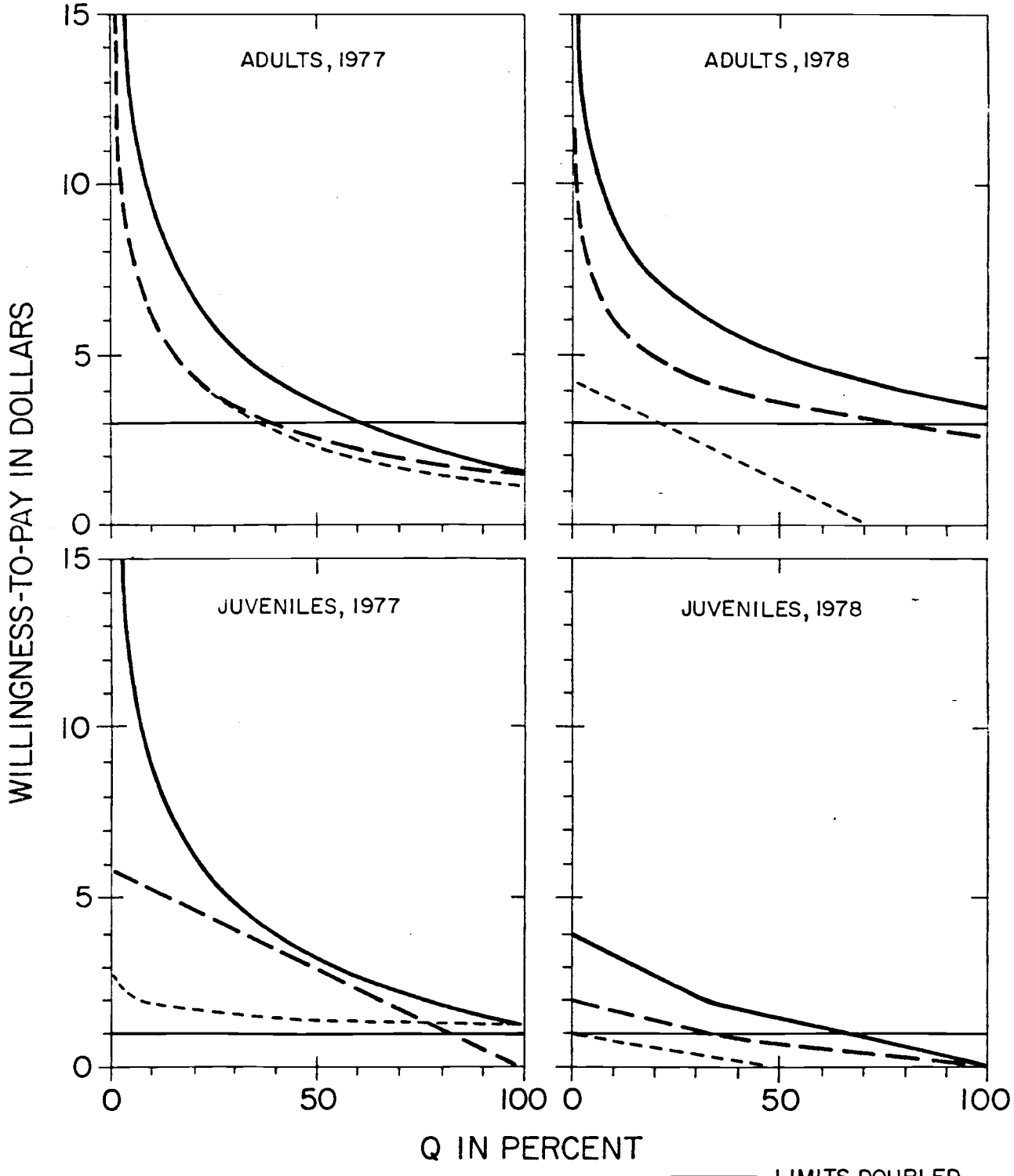

Figure 6. Willingness-to-Pay for a 6-Month Urban Fishing Permit as a Function of the Cumulative Frequency of Anglers Surveyed Willing to Pay at Least That Amount; Lakeside Lake

these prices for a significant percent of the anglers. In these cases, the ex post willingness-to-pay is obviously less than ex ante willingness-to-pay where the "value" of fishing at the lakes had yet to be experienced. Such a phenomenon is probably widespread, and not limited to urban fishing permits. Disappointment with a purchase after it has been made raises a philosophical question in the estimation of value--especially the value of publicly supported programs such as this urban fishing program. Should the total consumer benefit be based on observation of what people actually pay, or on what people say they would pay after they have evaluated the experience? Our estimates are based on the later criterion.

The demand equations were estimated for each 6-month period rather than for the whole year since it was felt that the second half of the year was really a different product; more trout fishing was available in 1978 than 1977 and the weather is different in the two periods. Demand curves for adult anglers at the two lakes suggest that the spring period is favored over the fall. At both Chaparral and Lakeside, a significant portion of the demand curve falls below the $3 permit price for the fall 6-month period, while the low point for the spring curve is about $3.

The opposite conclusions seem to hold for juveniles, with demand appearing slightly higher in the fall than in the spring. However, demand data for juvenile anglers was less abundant and more variable than for adult anglers, limiting the reliability of these curves.

Maximum Collectable Revenues at "Optimum" Prices

1977-78 Conditions

The "optimum" price is that permit price which would generate maximum revenue to the Arizona Game and Fish Department. Given the demand curves shown in Figures 5 and 6, the "optimum" permit price, the associated revenue that would be collected, and the number of permits that would be sold under 1977-78 conditions are shown in Table 2. The same information is given in Table 3 where it is assumed that the creel limits on the anglers' favorite fish are doubled.

The estimates are based on two criteria. If the elasticity of demand equals -1.0 within the range of zero to 100 percent of permit buyers, the "optimum" price is estimated at that point (see the discussion in Chapter 2). However, for some equations, the elasticity of demand equals -1.0 outside the range of data; that is, beyond 100 percent of permit buyers. This situation occurs where the demand curve becomes quite flat near 100 percent. The conclusion might be drawn that many more people would buy permits if the permit price were slightly lower. While that result might occur, the data and the analysis are not sufficient to support it since only permit buyers were interviewed. One cannot draw implications as to non-buyers' response to a lower price. Further, at least at Lakeside in the 1977 season, it appeared that no more anglers could be accommodated on many weekends. Congestion was setting in and lower permit prices with more participation would just make congestion worse. Therefore, the alternative criterion to an elasticity of -1.0 for establishing an "optimum" price is to choose that price on the demand curve where 100 percent of the permit buyers are included. That price would

Table 2. Maximum Collectable Revenues at "Optimum" Prices, 1977-78 Conditions

Lake	Year	Age Group	Population Size 1977-78[a]	Population Size At Optimum Price[b]	Optimum Price 1977-78[c]	Maximum Collectable Revenue
					----dollars----	
Chaparral	1977	Adults	1,621	1,018	3.35	3,410
Chaparral	1978	Adults	2,180	2,180	3.43	7,477
Chaparral	1977	Juveniles	1,427	1,427	1.70	2,426
Chaparral	1978	Juveniles	1,383	874	2.53	2,211
Lakeside	1977	Adults	1,526	1,526	1.61	2,457
Lakeside	1978	Adults	2,162	2,162	2.59	5,600
Lakeside	1977	Juveniles	1,099	539	2.95	1,590
Lakeside	1978	Juveniles	1,117	559	.75	418
TOTALS			12,515	10,285		25,589

[a]Actual size of the population that bought permits during the 1977-78 season.

[b]Size of the population that would buy permits at the "optimum", non-discriminating monopolist price.

[c]"Optimum", non-discriminating monopolist price under 1977-78 conditions.

Table 3. Maximum Collectable Revenues at "Optimum" Prices, Creel Limits Doubled from 1977-78 Conditions

Lake	Year	Age Group	Population Size 1977-78[a]	Population Size At Optimum Price[b]	Optimum Price, Doubled Limit[c]	Maximum Collectable Revenue
					----dollars----	
Chaparral	1977	Adults	1,621	1,621	3.59	5,819
Chaparral	1978	Adults	2,180	2,180	3.43[d]	7,477
Chaparral	1977	Juveniles	1,427	1,427	2.90	4,138
Chaparral	1978	Juveniles	1,383	692	4.00	2,766
Lakeside	1977	Adults	1,526	1,011	2.75	2,780
Lakeside	1978	Adults	2,162	2,162	3.40	7,351
Lakeside	1977	Juveniles	1,099	589	2.97	1,749
Lakeside	1978	Juveniles	1,117	559	1.50	838
TOTALS			12,515	10,241		32,918

[a]Actual size of the population that bought permits during the 1977-78 season.

[b]Size of the population that would buy permits at the "optimum" non-discriminating monopolist price.

[c]"Optimum", non-discriminating monopolist price if creel limits on anglers' favorite fish are doubled.

[d]Set at same level as under 1977-78 conditions rather than slightly lower as the demand curve shows.

generate more revenue than any higher price since at higher prices permit buyers drop out rapidly.

A permit price of about $3.40 would maximize Department of Game and Fish revenues from adult anglers at Chaparral (Table 2). The 1977 estimate is shown as $3.35 with estimated participation declining somewhat from actual participation. The 1978 estimate is $3.43 with projected participation at 100 percent of actual use. If permits are to have the same price in the fall and the spring, about $3.40 or perhaps $3.50 would be a reasonable price.

At Lakeside, adults apparently were less attracted to the urban fishing program--at least after they saw what they were receiving for their permit. The demand curve developed from 1977 data indicates that the permit price would have to fall to $1.61 in order to maintain participation at the 1977 rate. The demand curve for 1978 shows a $2.59 permit price in order to maintain participation. In both cases, maintenance of the current $3 price would result in less total revenue. A compromise price of $2 per permit is recommended.

For juveniles, the demand curves suggest that a higher permit price could be charged at both lakes (the 1978 juvenile demand equation for Lakeside is not considered reliable). One hundred percent of the 1977 juveniles at Chaparral would pay $1.70 per permit. Participation would be cut but revenues could rise with a $2.53 price according to the 1978 juvenile demand equation. The same would be true for 1977 Lakeside juveniles at a price of $2.95. So as not to cut participation drastically but still raise collected revenues, a $2 price is suggested for both lakes.

Recall that these evaluations are ex post, reflecting what anglers would pay if they were familiar with the program. The ex post estimate of

total maximum collectable revenue for the two lakes is $25,589. The ex ante value, as revealed by actual sales, was $27,505 (see Table 1; $27,505 includes the 5 percent sales fee).

Creel Limits on Favorite Fish Doubled

Adult response at Chaparral in the fall of 1977 indicated greater or equal participation at approximately the same "optimum" prices under doubled creel limits as estimated for the 1977-78 rules. Therefore, a $3.50 per permit price could generate about $2,400 more than for 1977-78 rules.

At Lakeside, a price higher than for 1977-78 would cause less than or equal participation but greater revenues. Here, about a $3.00 price per permit might generate as much as $2,000 additional revenue under doubled creel limits than under 1977-78 rules.

Juveniles at both lakes indicated a relatively greater response to the increased creel limit than did adults. But the increased revenue could only be achieved at even less participation than projected under "optimum" 1977-78 prices. All juveniles at Chaparral in 1977 were willing to pay a $2.90 permit price if the limit was doubled. Only some juveniles would pay $4.00 based on their 1978 experience, but enough would do so to raise total collectable revenue by several hundred dollars. At Lakeside, juveniles said they would keep constant or even increase participation at higher prices than under the 1977-78 rules. A price of $3.00 per permit at both lakes is suggested as a maximum-revenue-approximating price for juvenile anglers.

Total collectable revenue under doubled creel limits is projected as $32,918, only $5,413 above the revenues projected under 1977-78 rules. When one recognizes that only the rules were to be changed--not the stocking rate--one might conclude that a 19 percent increase in income would be well worth

Table 4. Total Consumers' Benefits Under Alternative Assumptions as to Permit Price and Size of Angler Population

Lake	Year	Age Group	Permit Prices and Angler Population at 1977-78 Levels				Permit Prices and Angler Population if "Optimum" Permit Prices Were Charged			
			1977-78 Conditions	Limits Doubled	Lake Not Stocked	Population Size	1977-78 Conditions	Population Size	Limits Doubled	Population Size
			--------Dollars--------			No.	Dollars	No.	Dollars	No.
Chaparral	1977	Adults	9,629	11,412	4,895	1,621	7,248	1,018	11,412	1,621
Chaparral	1978	Adults	10,856	12,688	6,126	2,180	10,856	2,180	12,688	2,180
Chaparral	1977	Juveniles	3,753	6,108	2,369	1,427	3,753	1,427	6,108	1,427
Chaparral	1978	Juveniles	4,232	5,573	3,153	1,383	3,304	874	4,145	692
Lakeside	1977	Adults	5,310	7,599	4,990	1,526	5,310	1,526	6,187	1,011
Lakeside	1978	Adults	8,713	12,345	3,329	2,162	8,713	2,162	12,345	2,162
Lakeside	1977	Juveniles	3,176	4,902	2,824	1,099	2,366	539	3,734	589
Lakeside	1978	Juveniles	927	1,865	279	1,117	721	559	1,442	559
TOTAL			46,596	62,492	27,965	12,515	42,271	10,285	58,061	10,241

the rule change. But one also wonders about the disappointment that could be generated as the stocked fish are depleted much more quickly.

Lakes Not Stocked

Formal estimates of maximum collectable revenues if the lakes were not stocked are not presented since the Department of Game and Fish could not charge an addition to the state license under those circumstances. (Under State law, all adult anglers must have a state license even in an unstocked urban area.) However, examination of the demand curves in Figure 5 and 6 show that, while the "lake not stocked" curves are generally below the "stocked" curves throughout the range of permit quantities, all the curves tend to converge at 100 percent of urban lake anglers. It seems that most anglers are at the lakes for the fishing--not for the catching.

Total Consumers' Benefit

Total consumers' benefits are the sum of the total payments for permits plus the consumers' surplus. They are calculated as the mean consumers' benefits times population size. Assuming the 1977-78 level of angler participation which was generated by the actual 1977-78 permit prices, the mean consumers' benefits per angler associated with each demand function was computed by evaluating the integral of each demand equation for Q of zero to 100 percent; that is, the total price times quantity areas under the demand curves exhibited in Figures 5 and 6 were evaluated.

For the 1977-78 season, total consumers' benefits are estimated as $28,470 at Chaparral and $18,126 at Lakeside for a grand total of $46,596 (Table 4, Column 4). This total is $19,050 greater than actual sales of

$27,546 (Table 1 including 5 percent sales fee). The difference was the consumers' surplus generated by the 1977-78 urban fishing program. Consumers' surplus was $14,219 at Chaparral and $4,831 at Lakeside.

If limits on the anglers favorite fish were doubled and permit prices and angler participation remained at their 1977-78 levels, total consumers' benefits rise to $62,492--$35,781 at Chaparral and $26,711 at Lakeside (Column 5). Total consumers' surplus at the two lakes would be $34,946.

Assuming that the lakes are not stocked, total consumers' benefits at both lakes are estimated as $27,965 (Column 6). Since no urban fishing permit would be required, all $27,965 would be consumers' surplus.[2/]

If the higher, "optimum", permit prices were charged in order to generate maximum revenue to the Game and Fish Department, participation is projected to fall below the 1977-78 levels. Therefore, while total revenue collected would rise, total consumer benefits would fall because of the decline in participation. Mean angler benefits are now evaluated as the area under the demand equation from Q equals zero to Q equals 100 minus the percent decline in participation (Table 4, Columns 8-12).

Total consumers' benefits under "optimum" prices,but with other 1977-78 conditions and creel limits, fall from $46,596 to $42,271 because participation falls from 12,515 permits to 10,285 permits. Total consumers' benefits with "optimum" prices and doubled creel limits falls from $62,492 to $58,061 because of reduced participation. Since permit prices are higher

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[2/] Unstocked fishing would be primarily for small black bullheads. This species has been introduced by persons unknown, and seems to reproduce in these conditions. Although the most anglers were aware of the species for which they would be fishing, they probably overestimated the fish population and their own future participation.

than in 1977-78 and total consumer benefits are lower, consumers' surplus obviously is reduced.

Benefits Versus Costs

Estimated costs of running the fishing program at the two urban lakes are presented in Table 5. Both actual costs of the program as it was implemented during the 1977-78 season and the estimated cost of a continuing program in which the supply of fish is contracted are shown. In 1977-78, for the experimental program, the Department of Game and Fish purchased, transported, and, in some cases, caught the fish to be stocked with their own manpower. Costs of a continuing program are estimated at about 38 percent less than the costs of the 1977-78 experimental program (Table 5). Even under the projected cost structure, the cost per fish, especially for catfish and carp, is a significant proportion of the price of an urban fishing permit. Tilapia are the least expensive but were also least popular with the anglers. Trout can be stocked only during the winter months. Catfish and carp are relatively expensive, but proved quite popular, especially with minority anglers.

Program costs are compared to estimated program benefits in Table 6. The net benefits under a future program are of most interest for planning purposes. Under 1977-78 fishing rules and permit prices, but with projected future costs, the program shows a net benefit to the 12,515 anglers involved of $7,728. If limits were doubled and permit prices and participation remained at the 1977-78 levels, the net benefit to the anglers rises to $23,625. No stocking and no cost gives the highest estimated net benefits of $27,965.

Table 5. Costs of a Two-Lake Urban Fishing Program[a]

Fish	Number Stocked	Actual Cost 1977-78		Estimated Cost for a Continuing Program	
		Total Cost	Cost Per Fish	Total Cost	Cost Per Fish
		dollars			
Carp	5,996	28,588	4.77	7,195	1.20
Trout	18,000	10,440	.58	8,100	.45
Tilapia	6,228	4,439	.71	1,718	.28
Catfish	13,987	19,141	1.37	21,855	1.50
Total	44,211	62,608		38,868	
Weighted Average			1.42		.88

[a]Data supplied by Arizona Department of Game and Fish, Urban Lakes Program (Gary Edwards, Fisheries Biologist), 1977-78.

Table 6. Urban Fishing Program Benefits Less Program Costs.

	Estimated Net Benefits	
	Actual 1977-78	Future Program
	----------dollars----------	
Total Consumers' Benefits Less Costs.		
Permit Prices and Angler Participation at 1977-78 levels.		
1977-78 Conditions	(-)16,012	7,728
Limits Doubled	(-) 116	23,624
Lake Not Stocked	27,965[a]	27,965[a]
Total Consumers' Benefits Less Costs.		
Permit Prices and Angler Participation if "Optimum" Permit Prices Were Charged		
1977-78 Conditions	(-)20,337	3,403
Limits Doubled	(-) 4,547	19,193
Maximum Collectable Revenue Less Cost.		
1977-78 Conditions	(-)37,019	(-)13,279
Limits Doubled	(-)29,690	(-) 5,950
Actual 1977-78 Revenues Less Costs	(-)36,439	(-)12,699

[a]With no stocking there are no costs or revenues.

Should the Department of Game and Fish decide to charge the "optimum" permit price, that is, the price that would maximize collectable revenue, angler participation would decline. If the 1977-78 fishing conditions and creel limits were retained, total consumers' benefits would exceed program costs by $3,403, but the Department of Game and Fish would spend $13,279 more than they would receive in revenues. If creel limits were doubled, the Department's net loss could be reduced to $5,950 and total consumers' benefits above program costs would rise to $19,193. Since future maximum collectable revenues are estimated as very close to actual 1977-78 revenues, projected Department loss with actual 1977-78 revenues and future program costs is $12,699--very similar to projected loss of $13,279 under a revised fee schedule and lowered program costs. The projected loss estimate of $13,279 is greater than the $12,699 loss estimate since a significant portion of the anglers reported that they would not pay the full 1977-78 fees in a future program.

Given these results, if the Department of Game and Fish should decide that positive angler benefits are worth a relatively minor operating loss, it is apparent that they should concentrate on reducing costs rather than adjusting permit fees. The 1977-78 fees apparently were a little too high for some angler groups but could be raised slightly for others without reducing participation. However, on the average, the 1977-78 prices of $3 per adult permit and $1 per juvenile permit seemed to produce about as much revenue as could be expected.

Projecting Angler Participation at Additional Lakes

Should the urban fishing program be expanded beyond the two experimental lakes, one would expect total participation to increase, but not at a proportional rate. In this section we posit the stocking of Kennedy Lake in Tucson in addition to stocking Lakeside, and estimate total participation, to illustrate a general participation projection procedure.

To project angler participation, the influence of two major independent variables was explored. Distance from residence to the lake and the income of permit holders were thought to be the most important of all variables in predicting participation. To test this hypothesis, participation equations were estimated for both experimental lakes--Chapparal and Lakeside.

The socioeconomic areas defined in Tucson Trends 1978 and Inside Phoenix '78 were used as districts of permit holders' residences. Using street addresses supplied on the questionnaires, each first-time interview was plotted on metropolitan area maps and the number of permits per area was determined. The number of sampled permits was divided by district population to calculate permits per ten thousand inhabitants (P/10K) for each area as well as for the metropolitan area as a whole.

The mean distances travelled (DIS) to the lakes from each area were estimated along major thoroughfares. It was discovered that, for both Phoenix and Tucson, the income of an angler was highly correlated with distance from the lakes. In both cities, average income increases as one goes north by northeast from the lakes, and average income drops as one goes east by southeast from the lakes. Hence, only distance was used to describe the relationship between residence area and permits per ten thousand population.

Five possible models of permits as a function of distance were estimated using ordinary least squares regression. The functional form common to both lakes giving the largest explanation of variance was selected as "best."

For Chaparral, the equation is:

$$P/10K = \underset{(-3.228)}{-5.118} + \underset{(6.482)}{39.111}(DIS^{-.5}) \qquad R^2(\text{corrected}): \ .719$$

and for Lakeside, the equation is:

$$P/10K = \underset{(-1.808)}{-3.092} + \underset{(6.837)}{25.176}(DIS^{-.5}) \qquad R^2(\text{corrected}): \ .821$$

where

R^2(corrected) is the percentage of the variance explained by the function, corrected for degrees of freedom, and t-statistics are in parentheses below the coefficient.

What might happen if a similar lake in the same city were to be stocked in addition to the original lake? An analysis is made for Kennedy Lake, a potential new site for urban fishing in Tucson and almost a mirror image of Lakeside in terms of location.

The procedure is as follows:

(1) Estimate distances to each lake from each area of residence whose population might be attracted to the new fishing site,

(2) Find the breakpoint line at which, because of equal distance, an angler would be indifferent to going to either lake,

(3) Recalculate new participation rates (P/10K) for the two fishing areas using the original equation based on the assumptions that

   (a) people will react to Kennedy as they responded to Lakeside, and

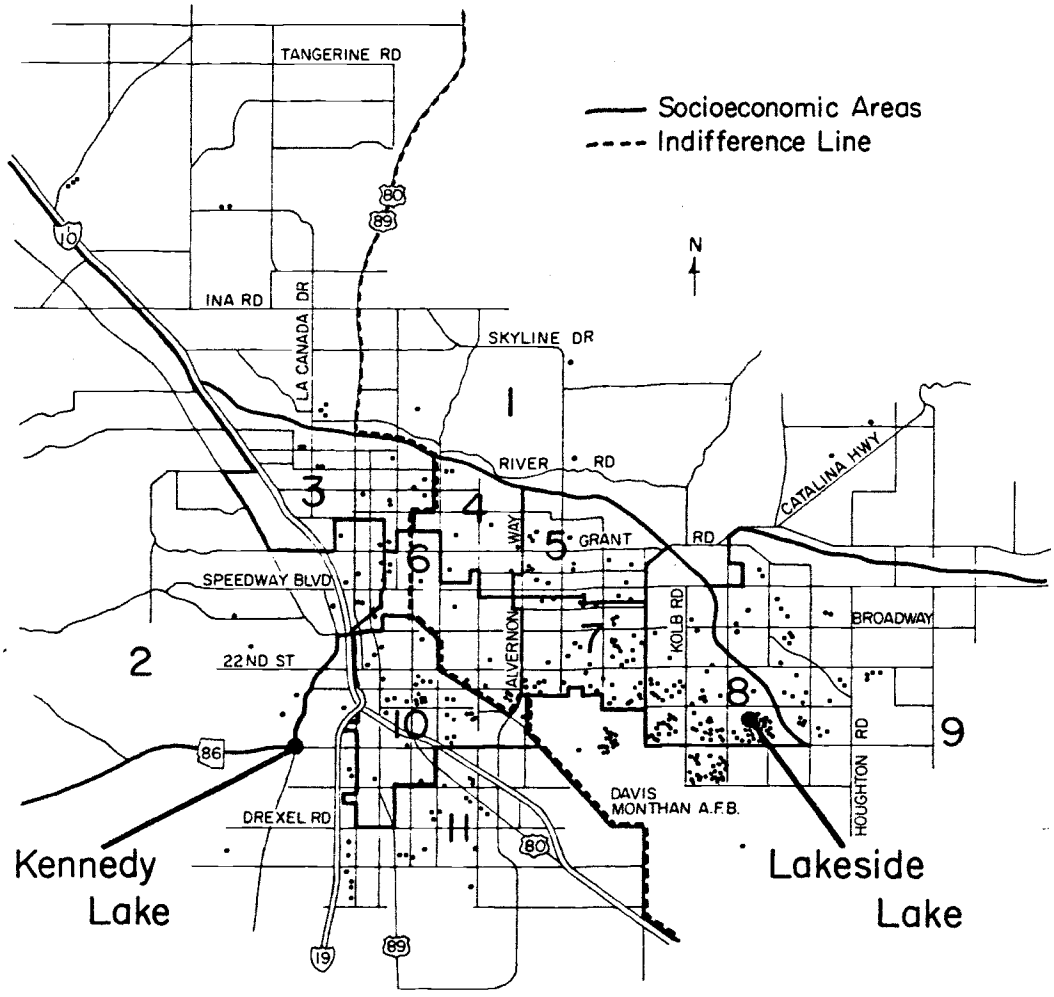

Figure 7. Lakeside Participation in 1977-78: Plot Showing Scatter of Permits Sampled, Metropolitan Socioeconomic Districts, and Indifference Barrier.

(b) crossing of the "distance indifference line" by anglers either will be zero or will cancel out.

(4) Recalculate the number of permits per area, and

(5) Recalculate the number of permits per metropolitan area as a whole.

Figure 7 shows the plot of permits for Lakeside by socioeconomic district, and the indifference line between Kennedy Lake and Lakeside. Areas 2, 3, 10, and 11 are entirely on the Kennedy side of the indifference line while areas 4, 5, 7, 8, and 9 are entirely on the Lakeside side. Areas 1 and 6 straddle the indifference line and, therefore, proportions of anglers going to each lake are determined based on the amount of area on either side of the line.

Using the estimated relationships between P/10K and DIS, new values of P/10K after the stocking of Kennedy Lake can be derived given new distance figures for the affected areas. Multiplying the new P/10K by the area's population yields new permit estimates by area.

Results show that permit sales would be expected to increase by 23 percent, raising total permit sales in Tucson from 5,904 to 7,333 if both Lakeside and Kennedy were stocked.

CHAPTER 4

SOCIOECONOMIC PHENOMENA

The typical urban angler, his participation, and his feelings about the program are described in this chapter. Analysis of use by minorities may have implications for equitable policy in future programs. Also, angler comments, complaints, and suggestions could help planners learn what the average angler expects from an urban fishing program.

Minority Usage

Chaparral Lake

More than 98 percent of all households in the City of Scottsdale are Anglo, while only 1 percent are Mexican-American and less than 0.5 percent are Black or American Indian. For the Phoenix metropolitan area as a whole, households are 90 percent Anglo, 8 percent Mexican-American, 3 percent Black, and less than 1 percent Oriental.[3/] However, usage of Chaparral Lake by these minorities, especially by Blacks, is considerably higher than their proportion of the population (Figure 8). For a 2-month period during the 1977 catfish season, the percentage of Blacks at Chaparral Lake was over ten times that of Blacks in the Phoenix metropolitan area and was also higher than the proportion of Blacks in the predominately Black communities near the airport. Oriental participation was not observed until December,

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[3/] The Total is greater than 100 percent because of households with more than one ethnic group represented (Inside Phoenix, 1978).

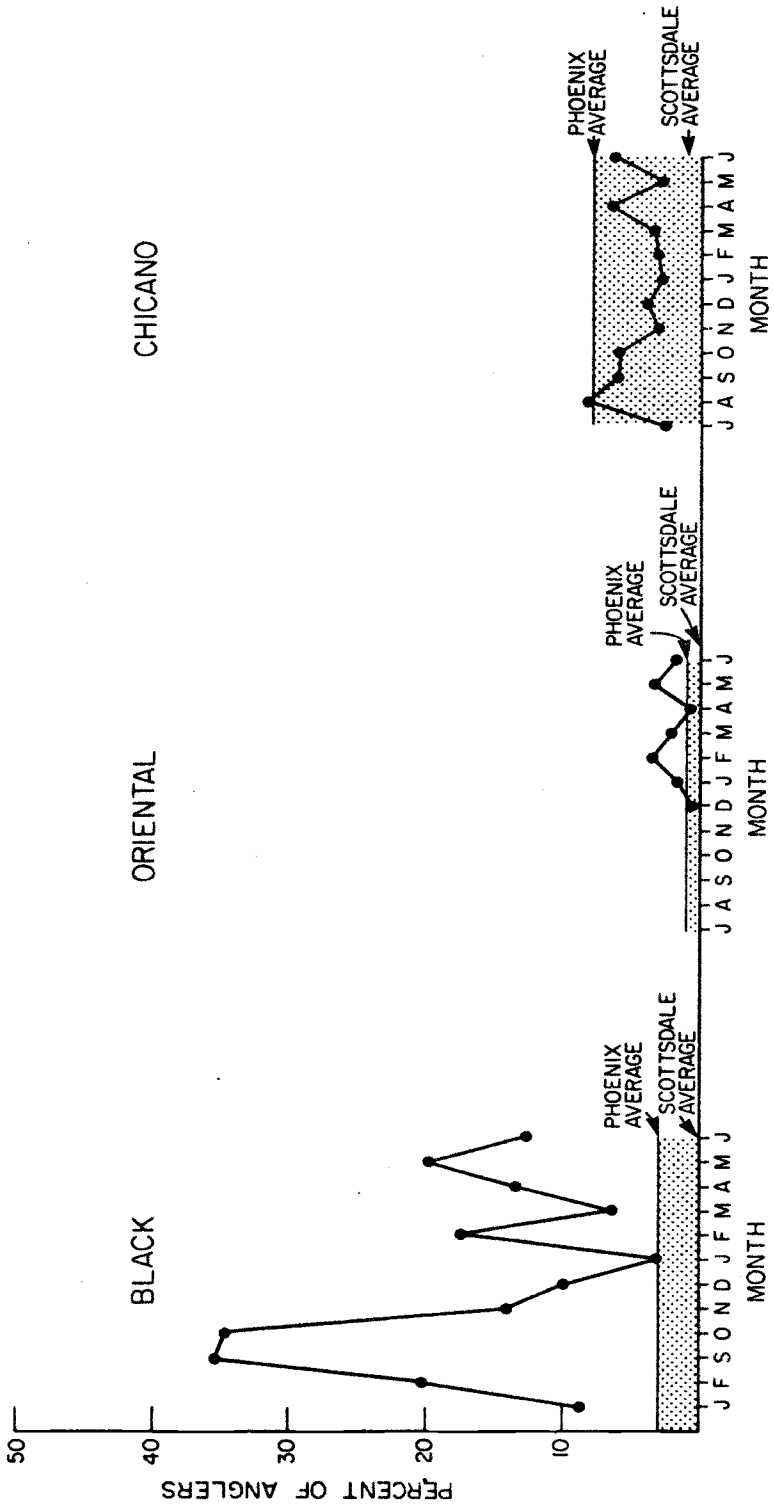

Figure 8. Percentages of Minorities at Chaparral Lake by Month, Compared to Phoenix and Scottsdale Area Minority Percentages

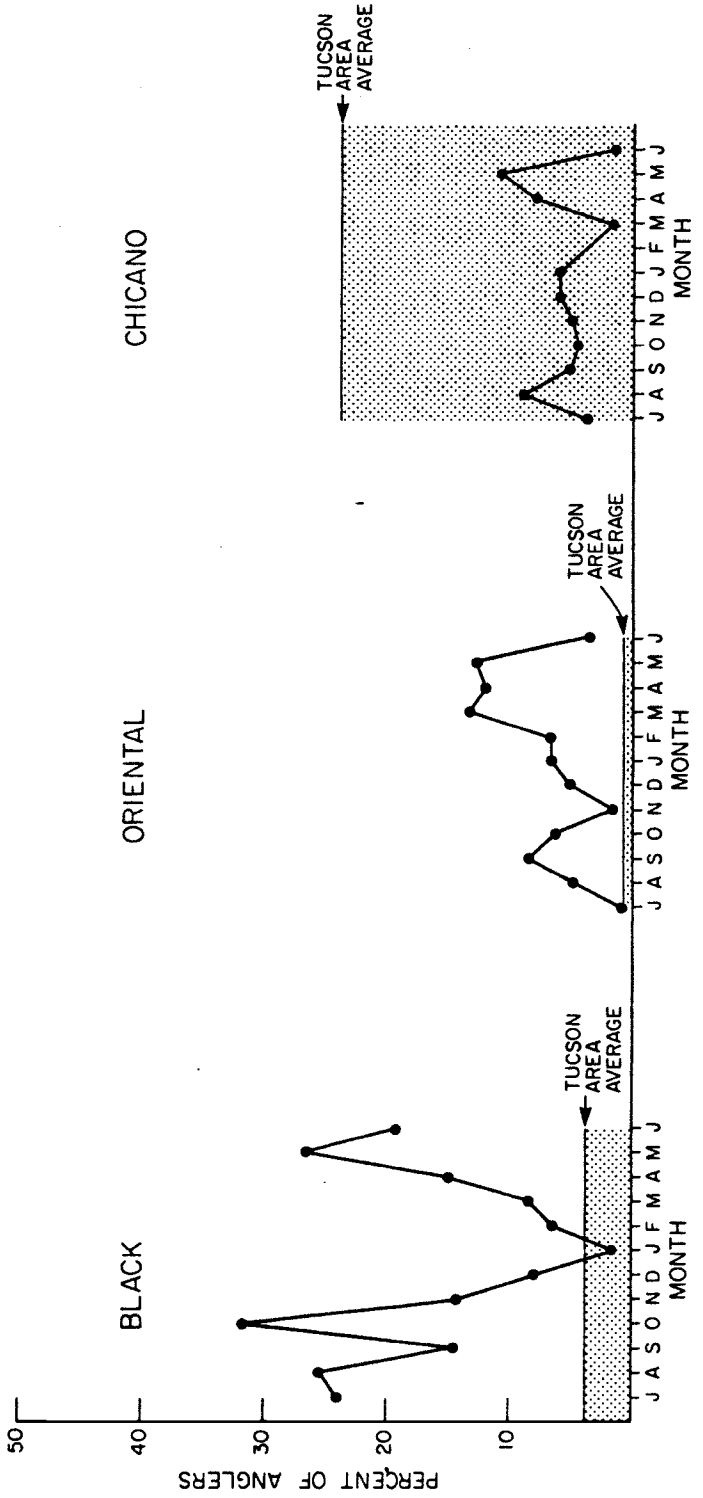

Figure 9. Percentages of Minorities at Lakeside Lake by Month, Compared to Tucson Area Minority Percentages

Table 7. Participation by Age and Sex at Chaparral and Lakeside by Month, 1977-78

Month	Sex				Age			
	Chaparral		Lakeside		Chaparral		Lakeside	
	Female	Male	Female	Male	Under 14	Over 14	Under 14	Over 14
	----------percent----------				----------percent----------			
July	18.7	81.3	12.4	87.6	43.1	56.9	34.9	65.1
August	27.0	73.0	17.1	82.9	35.4	64.6	33.3	66.7
September	33.6	66.4	21.0	79.0	21.7	78.3	26.0	74.0
October	34.7	65.3	25.0	75.0	26.8	73.2	25.0	75.0
November	24.9	75.1	14.0	86.0	33.6	66.4	29.0	71.0
December	14.5	85.5	14.0	86.0	41.1	58.9	22.0	78.0
January	14.4	85.6	11.2	88.8	23.3	76.7	13.6	86.4
February	14.8	85.6	18.4	81.6	23.6	76.4	20.3	79.7
March	16.9	83.1	16.7	83.3	25.9	74.1	5.8	94.2
April	24.9	75.1	24.5	75.5	26.2	73.8	20.7	79.3
May	27.4	72.5	31.3	68.7	21.4	78.6	26.5	73.5
June	19.6	80.4	12.5	87.5	38.9	61.1	47.0	53.0

but afterward was higher than the Scottsdale and Phoenix area average for that minority.

Black and Mexican-American usage is particularly high compared to usage by other groups during the warm weather catfish season. Usually these minorities claimed that their favorite fish was catfish, but this choice may be more income-related than is commonly believed. These minorities are typically much poorer than the anglos of the area, and trout stamps may cost more than their budgets allow.

Lakeside Lake

Minority usage at Lakeside Lake followed essentially the same pattern as at Chaparral (Figure 9). Blacks appear to be overrepresented compared to their proportion in metropolitan area. The pattern of minority participation (low in the winter and high in the summer) is more exaggerated than at Chaparral. Orientals are more numerous, perhaps as a result of Lakeside's proximity to Davis-Monthan Air Force Base. Mexican-American usage, unlike that at Chaparral, is low in light of the demographics of Tucson, but about the same as in Phoenix.

Discussion

These observations must be qualified. Since the data on angler ethnicity came from observation rather than from interviews where repeating anglers were identified, doubled counting of any race may have occurred. Thus, the percentage of Blacks or Mexican-Americans buying licenses could be somewhat lower or higher than indicated compared to area demographics. However, the estimates accurately portray the ethnicity of the anglers at the lakes in any given month.

Intensity of minority usage could be the result of both cultural preference or income. To discover which effect was larger, a cross-tabulation of race and distance travelled was made. If results showed that a higher percentage of minorities--especially Blacks--fishing at the lakes came from a relatively high income area near the lake, minority usage could be attributed more to cultural preferences than to income level and vice versa.

Results showed that the minorities came primarily from the lowest income areas of both cities, which correspond to some of the farthest distances travelled. Even in the case of Lakeside, which is near Davis-Monthan Air Force Base with a relatively high Black population, most Black anglers resided in the more distant neighborhoods. Thus, urban fishing may be an inferior good; that is, as income increases, demand for the good decreases. A further test of this hypothesis is described in Appendix B.

Participation by Age and Sex

Women of both Phoenix and Tucson prefer fishing in the milder fall and spring months (Table 7). As would be expected, the greatest number of juveniles participate in months when school is not in session--the summer and holiday months.

Miscellaneous Angler Responses

Several questions were asked to discover the anglers' toward the urban fishing program and the place that the program fit into their lives. These questions and the angler responses follow.

Table 8. Would You Have Come to the Park Today If You Weren't Going to Fish?

Responses	Percent	Percent
Would not be at the park		83.1
Would be at the park		16.9
For exercise	43.0	
No specific reason	31.5	
Picnic/family outing	28.4	
Any water-related activity other than fishing	7.1	
TOTAL	100.0	100.0

Table 9. If You Weren't Here Fishing Today, What Would You Be Doing?

Category	Percent of Total	Response	Percent of Category
At Home	54.7	Watching Television	35.3
		"At Home"	30.3
		Sleeping	11.8
		Doing Homework	11.0
		Gardening	5.2
		Reading/Studying	3.4
		Eating/Cooking	2.2
		Other	0.8
Sports and Exercise	10.1	Playing	21.4
		Swimming	17.8
		Golf	9.8
		Walking	8.9
		Other (each 1.8 to 7.1 percent)	42.1
Working or in Class	4.9		
Fishing Elsewhere	2.2		
Miscellaneous	10.1	Nothing	13.3
		Drinking	12.0
		Hobbies	8.2
		Picnic	7.0
		Hunting/shooting	6.3
		Other (each 0.6 to 5.7 percent)	53.2
No Answer	18.0		

Would You Have Come to the Park Today If You Weren't Going to Fish?

Only 16.9 percent of all respondents claimed that they would have come to the park if they weren't going to fish (Table 8). Apparently stocking the lakes significantly increased park attendance during the 1977-78 season, especially at Lakeside, which lacks a municipal swimming pool and has no park facilities on three of its four shores.

The most common response of those anglers who would have been at the lake anyway was for exercise (including sporting events), using a playground, and jogging or walking (43 percent). Another large group (31.5 percent) said they could give no specific reason for coming to the park other than to sit or to get out of the house. Of this group, over half were housewives, retired, unemployed, disabled or students.

If You Weren't Fishing Here Today, What Would You Probably Be Doing?

Over half of all those interviewed (54.7 percent) said they would have been at home if they were not fishing at the urban lake (Table 9). Within this category, various responses were television viewing, housework, sleeping and simply "at home." A total of 4.9 percent confessed that they would or should be at work or in class if they weren't fishing; only 2.2 percent said they would be fishing elsewhere.

A number of theoretical studies in the economics of outdoor recreation have argued that the opportunity cost of the time involved in the recreational activity should be included when the value of that activity is estimated (Brown and Nawas, 1973; McConnell, 1975). Apparently, with respect to the urban lakes fishing program, the opportunity cost of time to the individual

Table 10. Do You Have Any Comments About the Urban Fishing Program?

Category	Example	Percent
Highly Favorable	Love it, terrific	37.9
Slightly Favorable	Program is OK	10.9
Slightly Unfavorable	Needs more fish	13.5
Highly Unfavorable	Lousy fishing, a dud, will not return	0.8
No Comment		36.9
TOTAL		100.0

is close to zero. On the other hand, from society's viewpoint, the social benefit provided by the urban fishing program may be greater than having individuals simply doing nothing.

Do You Have Any Comments About the Urban Fishing Program?

Comments were grouped into five categories: highly favorable, slightly favorable, highly unfavorable, and no comment. Favorable comments outnumbered the unfavorable by nearly three and one half to one, and the highly favorable category was the largest of all five groups (Table 10).

The single most popular feature of the urban lakes fishing program was the convenience of having a stocked lake nearby. Anglers overwhelmingly approved of the program as a gasoline and time saver, and some hope for expansion of the program to other areas of Tucson and Phoenix was expressed.

Although 22 percent of those who made comments had some complaint, nearly 90 percent of the complaints were accompanied by some praise or the comment lodged was unrelated to the urban fishing program itself. Examples of these complaints are: "very good, but not stocked enough," "needs more garbage cans and trees," and "not for adults but terrific for kids" (Table 11). Complaints about stocking were most common. Most anglers said that the lakes were not stocked enough or that small fish were stocked too often and should not be stocked at all (there were plants of channel catfish fingerlings in November at both lakes). Significant to the economic analysis, only 8.2 percent commented that the permit cost was too high, and only 4.4 percent said the limits were too low.

Table 11. A List of Complaints by Percent[a].

Complaint Category	Percentage of Responses
Stocking (not enough)	48.7
Uncleanliness	8.2
Permit Cost	8.2
Motorized Model Boats on the Lake	7.6
Not Enough Trees	6.3
Needs More Patrolling	6.3
Limits Are Too Low	4.4
Lake is Too Small or Shallow	3.8
Too Many Kids	2.5
Miscellaneous	4.0
TOTAL	100.0

[a]Sixty-three percent of the sample had comments, 22 percent of those who commented had some complaints.

Table 12. Reasons Given by 1977 Anglers for Not Buying a 1978 Urban Fishing Permit, by Percent[a]

Reason[b]	Adults		Juveniles		Total
	Male	Female	Male	Female	
	percent				
Success Not Good Enough	46.9	12.4	31.6	9.1	25.6
No Time to Fish	43.4	13.9	31.0	11.6	15.0
Price of Permit Too High	47.4	19.0	23.6	9.7	8.8
Lake Too Far from Home	38.3	8.9	44.4	8.4	7.3
No Transportation to Lake	19.3	6.2	58.5	15.9	6.0
Moved from Area	33.1	8.4	45.2	13.2	5.7
Did Not Like Fish Stocked	42.6	8.6	41.4	7.4	5.5
Daily Limit Too Small	41.5	11.1	41.5	5.9	4.6
Too Many People at Park	48.1	5.4	33.3	13.2	4.4
Did Not Enjoy Urban Fishing	47.2	3.8	45.3	3.8	1.8
No Reasons	19.3	3.2	67.7	9.7	1.2
Did Not Like Park Location	41.7	4.2	50.0	4.2	0.3
Other Reasons	49.5	12.4	28.9	9.3	13.3

[a]Percents do not add to 100% as more than one response was allowed.

[b]Reasons ranked in order by total responses for both lakes.

Anglers That Did Not Return

The Arizona Department of Game and Fish noticed that there was an unexpectedly low rate of returning anglers in the 1978 season. Only 28.2 percent of adults and 19.8 percent of juveniles who purchased permits in 1977 also purchased them in 1978. The Department mailed a questionnaire, a copy of which is in Appendix C, to those individuals who did not buy an urban fishing permit the second time.

For both lakes, the primary reason given by anglers who did not purchase the 1978 urban license was, quite predictably, that success was not high enough to warrant purchase of another permit (Table 12). However, in light of the apparently low opportunity cost for time repeated by anglers when interviewed at the lakes, the second most common response was less expected--that people didn't have enough time to fish.

The third most common response was that the price of the permit was too high. The permit cost ranked fourth at Chaparral and third at Lakeside (third overall) which could reflect the slightly greater affluence of the Scottsdale/Phoenix area compared to Tucson.

The complaints about lack of time and permit cost reported on this mailed questionnaire may appear at odds with the reports of anglers interviewed at the lakes who said they had little else to do and who most thought the permit cost was reasonable. However, the positive responses were from people with permits who were fishing. Those with lack of time and complaints about permit cost already had dropped out of the program.

APPENDIX A

DETAILS OF THE ESTIMATION PROCESS

The Data

The data were gathered by personal interviews made at both lakes throughout the entire year of the stocking program. During each week, two weekdays and one day of the weekend were selected at random. Once the days were determined, a time period for each day was randomly drawn. Each day had been divided into four time periods. Morning was from 6 a.m. until 10 a.m.; noon included hours from 10 a.m. to 2 p.m.; afternoon was from 2 p.m. until 6 p.m.; night extended from 6 p.m. until 10 p.m. or closing of the park, whichever came first.

Upon arrival at the lake, the interviewer determined the interview sample size. A count of all people at the lake at that instant was made (I). If (I) was less than ten, each angler was interviewed. If (I) was more than ten, every nth person along the perimeter of the lake was interviewed where

$$n = \frac{I}{10}$$

n rounded to the nearest integer. Because of limitations on interviewers' time, no more than ten interviews were taken in any day.

Since interviews were taken throughout the entire year, reinterviews were possible. However, to avoid antagonizing the anglers, and because angler views were not likely to change rapidly, an angler was not interviewed more than once each month. If a recently interviewed angler fell into the sample,

he was replaced with the next qualifying individual. If a previously-interviewed angler was acceptable (i.e., interviewed over a month ago), he was asked only the circled questions on the questionnaire (see Appendix C). All anglers at the lake during the specified period were tallied regardless of their reinterview status. The interviewer made one complete circle about the lake per visit.

The numbers of interviews and reinterviews are listed in Table A.1. A total of 1,016 interviews and 186 reinterviews were completed at the two lakes. Interviews were 8 percent of the 12,515 urban fishing permits sold to adults and juveniles in the state.

The data were recorded on one of two alternative personal interview questionnaires, each consisting of 29 questions. One of the questionnaires was used on alternate weeks. Both questionnaires are in Appendix C. One is designated the yellow questionnaire, the other the green.

Both questionnaires were designed to determine whether or not an angler would be willing to pay a specific amount for fishing at the urban lake under three different conditions: (a) if the fishing were identical to the fishing as it was during the program in 1977-78, (b) if the creel limits on the angler's favorite fish were doubled, and (c) if the lake was not stocked. The green questionnaire was a bidding game where the dollar amounts were increased in increments of $5 to a maximum ot $20. Values were increased by $5 dollars for question (b) if the response to (a) was yes and remained the same for (b) if the answer to (a) was no.

The yellow questionnaire was identical with one exception--an angler was asked simply the maximum amount he would be willing to pay for

Table A-1. Total Interviews and Reinterviews

Lake	Year	Age Group	Interviewed[a]	Reinterviews[b]
Chaparral	1977	Adults	262	46
Chaparral	1978	Adults	209	43
Chaparral	1977	Juveniles	49	1
Chaparral	1978	Juveniles	35	0
Lakeside	1977	Adults	213	39
Lakeside	1978	Adults	193	37
Lakeside	1977	Juveniles	42	2
Lakeside	1978	Juveniles	13	18
TOTAL ADULTS			877	165
TOTAL JUVENILES			139	21
TOTAL			1,016	186

[a]First time interviews only.

[b]Total number of reinterviews includes more than one reinterview per person if applicable; also includes reinterviews of anglers who purchased permits in both 1977 and 1978.

the urban fishing permit under the three conditions outlined above. Both questionnaires asked how much the angler would be willing to sell his permit if he could not buy another for six months.

A tally sheet also was used each interview day to summarize general fishing statistics: how many people were fishing, what fish were caught, how many hours an angler had been fishing, and the breakdown of the population at the lake by race, sex, and age group.

The Analysis

Attempts were made to develop demand functions using 4 alternative procedures and/or data sets. The alternatives were as follows:

1. The Clawson-Hotelling travel cost approach.
2. Expressed willingness-to-pay using the 5-dollar auction data.
3. Expressed willingness-to-pay in direct response to the question.
4. Expressed willingness-to-sell.

Clawson-Hotelling Travel Cost

The Clawson-Hotelling travel-cost approach is generally considered the superior procedure for estimation recreation demand, since it relies on observation of actual behavior rather than simply on expressions of willingness-to-pay or to-sell which could be subject to interviewer or interviewee bias. Examples of successful use of the travel-cost approach in Arizona are reported in Martin, Gum and Smith (1974) and Sublette and Martin (1975). This approach requires an estimate of total visits per person, in order to relate number of visits to the variable cost of a visit and to distance travelled.

Total visits were estimated by evaluating the number of times a person had visited the lake since purchasing his permit, then forecasting his participation to the end of the permit period at the same rate. Reinterviews were useful to increase accuracy since they gave a running record of an individual's visits.

The derived total visits variable for each individual was regressed by ordinary least squares stepwise multiple regression against cost, distance, and other independent variables such as income, age, race, and sex.

However, both lakes are situated in residential areas and, in many cases, the urban lakes are closer to the anglers' homes than are their places of employment. In addition, the radius of the participation area generally did not exceed 20 miles, which in the Southwest, may be no farther than driving to the grocery store. Thus, cost and distance, the crucial variables for this approach were highly correlated, and neither variable alone gave estimates at an acceptable level of statistical significance. People appear to simply be unaware of time and travel costs in these restricted geographic areas. Similar results were predicted by Duttweiler (1975) and substantiated by Sublette and Martin (1975) for other close-to-town recreation activities. As discussed in Chapter 3 (Projecting Angler Participation), distance was related to permits per capita. But once the permit is purchased, distance is not related to number of trips.

Direct Response to Willingness-to-pay

The most successful of the 4 alternative demand analyses was from the direct questions as to the anglers' maximum willingness-to-pay for a 6 month

permit. These results are those reported and discussed in Chapter 3 of this report.

The data by lake, year, and age group showing the maximum dollar amounts an angler would be willing to pay and the cumulative frequency in percent of anglers who would be willing to pay at least that amount were tabulated. Functions were estimated in terms of percentages rather than actual numbers so that all curves could be compared directly. Demand equations were estimated by ordinary least squares.

Unless a function was a straight-line equation, linear transformations were made before estimating the function by regression. First, the functional form--usually an exponential--was estimated. Generally, these were of the form

$$P = a + bX,$$

where

$X = Q^{-n}$, $0 < n < 1$,

P = Willingness-to-pay for a 6-month permit in dollars, and

Q = Cumulative frequency of anglers who would be willing to pay at least that amount in percent.

Then, if autocorrelation resulted, residuals of the equation (P actual minus P estimated) were observed and n was adjusted higher or lower, depending upon the pattern of the residuals. Iterative regressions were run until the following criteria were met:

(1) t-statistics of the constant terms and the variable coefficients were at least at the 1.0 percent confidence level;

(2) R^2 values were not less than .7 and preferably above .85; and

Table A-2. Willingness-to-Pay Demand Functions Derived from Direct Questioning

Lake	Year	Age Group	Conditions	Equation[a]	R^2[b]
Chaparral	1977	Adults	1977-78	$P = -66.03 + 85.65\ Q^{-.05}$ (-8.00) (9.41)	.829
			Limits Doubled	$P = 2.44 + 36.37\ Q^{-.75}$ (4.03) (19.95)	.959
			Not Stocked	$P = -2.96 + 14.19\ Q^{-.25}$ (-3.71) (9.48)	.899
Chaparral	1978	Adults	1977-78	$P = 1.89 + 15.43\ Q^{-.50}$ (5.95) (48.64)	.995
			Limits Doubled	$P = -2.17 + 24.47\ Q^{-.33}$ (-5.62) (45.61)	.944
			Not Stocked	$P = 2.47 + 3.22\ Q^{-.40}$ (3.45) (4.22)	.704
Chaparral	1977	Juveniles	1977-78	$P = -6.69 + 13.29\ Q^{-.10}$ (-7.06) (11.57)	.957
			Limits Doubled	$P = -23.30 + 32.98\ Q^{-.05}$ (-4.93) (6.10)	.783
			Not Stocked	$P = -2.74 + 6.28\ Q^{-.10}$ (-4.72) (9.29)	.945

Table A-2, continued

Lake	Year	Age Group	Conditions	Equation[a]	R^2[b]
Chaparral	1978	Juveniles	1977-78	$P = 5.06 - 0.04\ Q$ (13.60) (-6.67)	.897
			Limits Doubled	$P = 8.03 - 0.08\ Q$ (20.27) (-9.39)	.926
			Not Stocked	$P = 3.78 - 0.03\ Q$ (16.37) (-7.78)	.908
Lakeside	1977	Adults	1977-78	$P = -4.02 + 17.80\ Q^{-.25}$ (-6.56) (18.52)	.974
			Limits Doubled	$P = -8.25 + 31.38\ Q^{-.25}$ (11.86) (27.49)	.987
			Not Stocked	$P = -5.15 + 19.98\ Q^{-.25}$ (-3.90) (8.10)	.902
Lakeside	1978	Adults	1977-78	$P = -10.40 + 20.58\ Q^{-.1}$ (-3.18) (5.55)	.856
			Limits Doubled	$P = -40.42 + 55.17\ Q^{-.05}$ (-6.02) (7.36)	.884
			Not Stocked	$P = 4.30 - 0.06\ Q$ (7.18) (-3.45)	.785

Table A-2, continued

Lake	Year	Age Group	Conditions	Equation[a]	R^2[b]
Lakeside	1977	Juveniles	1977-78	$P = 5.89 - 0.06\ Q$ (13.53) (-7.18)	.878
			Limits Doubled	$P = -13.53 + 33.79\ Q^{-.18}$ (-19.53) (28.31)	.989
			Not Stocked	$P = 2.54 - 0.28\ \ln Q$ (10.71) (-3.52)	.740
Lakeside	1978	Juveniles	1977-78	$P = 2.00 - 0.03\ Q,$	$0.0 \leq Q \leq 33.3$
				$P = 1.50 - 0.015\ Q,$	$33.3 \leq Q \leq 100.0$
			Limits	$P = 4.00 - 0.06\ Q,$	$0.0 \leq Q \leq 33.3$
			Doubled	$P = 3.00 - 0.03\ Q,$	$33.3 \leq Q \leq 100.0$
			Not Stocked	$P = 1.00 - 0.02$	$0.0 \leq Q \leq 50.0$
				$P = 0.00$	$50.0 \leq Q \leq 100.0$

[a] P is willingness-to-pay in dollars.
Q is cumulative frequency in percent of people willing to pay at least P.
t-statistics are in parenthesis below the corresponding coefficient.

[b] R^2 is adjusted for degrees of freedom.

Table A-3. Willingness-to-Pay Values; Five Dollar Auction (Green Questionnaire) Compared with Direct Question Approach (Yellow Questionnaire), Adults Only.

Lake	Year	Fishing Condition	Willingness to Pay (dollars)	Cumulative Frequency Direct Question (percent)	Cumulative[a] Frequency; 5-Dollar Auction (percent)	Residual[b]
Chaparral	1977	1977-78 Conditions	5	50.0	42.2	7.8
			10	24.0	10.8	13.2
			15	11.5	3.0	8.5
			20	2.1	0.9	1.2
		Limits Doubled	5	43.8	34.4	9.4
			10	38.4	8.1	30.3
			15	24.7	4.1	20.6
			20	11.0	2.6	8.4
		Lake Not Stocked	5	20.3	10.1	10.2
			10	8.5	1.4	7.1
			15	1.7	0.4	1.3
			20	0.0	0.0	0.0

Table A-3, continued.

Lake	Year	Fishing Condition	Willingness to Pay (dollars)	Cumulative Frequency Direct Question (percent)	Cumulative[a] Frequency; 5-Dollar Auction (percent)	Residual[b]
Chaparral	1978	1977-78 Conditions	5	60.2	24.6	35.6
			10	35.5	3.6	31.9
			15	16.1	1.4	14.7
			20	7.5	0.7	6.8
		Limits Doubled	5	39.5	41.3	- 1.8
			10	36.0	8.3	27.7
			20	7.0	1.3	5.7
		Lake Not Stocked	5	20.8	1.8	19.0
			10	9.1	0.1	9.0
			15	3.9	0.0	3.9
			20	0.0	0.0	0.0

Table A-3, continued.

Lake	Year	Fishing Conditions	Willingness to Pay (dollars)	Cumulative Frequency Direct Question (percent)	Cumulative[a] Frequency 5-Dollar Auction (percent)	Residual[b]
Lakeside	1977	1977-78 Conditions	5	49.4	15.2	34.2
			10	27.6	2.6	25.0
			15	14.9	0.8	14.1
			20	8.0	0.3	7.7
		Limits Doubled	5	48.1	31.5	16.6
			10	40.5	8.7	31.8
			15	20.2	3.3	16.9
			20	3.8	1.5	2.3
		Lake Not Stocked	5	29.3	15.0	14.3
			10	14.7	3.0	11.7
			15	5.3	1.0	4.3
			20	1.3	0.4	0.9

Table A-3, continued.

Lake	Year	Fishing Condition	Willingness to Pay (dollars)	Cumulative Frequency Direct Question (percent)	Cumulative[a] Frequency 5-Dollar Auction (percent)	Residual[b]
Lakeside	1978	1977-78 Conditions	5	52.5	18.2	34.3
			10	28.7	1.1	27.6
			15	10.9	0.4	10.5
			20	5.9	0.0	5.9
		Limits Doubled	5	57.1	48.9	8.2
			10	55.2	6.1	49.1
			15	30.4	0.9	29.5
			20	7.6	0.2	7.4
		Lake Not Stocked	5	12.9	0.0	12.9
			10	8.6	0.0	8.6
			15	4.3	0.0	4.3
			20	0.0	0.0	0.0

[a]Cumulative Frequency is derived from equations in Table A-2.

[b]Residual is the 5-dollar auction frequency less the direct question frequency.

(3) the Durbin-Watson statistic for autocorrelation did not fall in the autocorrelation range.

The final derived willingness-to-pay equations for all three willingness-to-pay levels--conditions for the 1977-78 season, if the creel limits on the angler's favorite fish were doubled, and if the lake were not stocked--are shown in Table A.2 for each lake, year, and age group. Graphs of the equations are in Figures 5 and 6 (Chapter 3). The results for Lakeside Juveniles in the 1978 season were derived without the aid of regression.

The 5-dollar Auction

An alternative method of evaluating willingness-to-pay is the 5-dollar auction (green questionnaire). However, since only four points were available, demand functions could not be estimated using regression methods. Instead, the data points are presented in Table A.3 when they are compared with results from the direct question regressions.

Values from the auction are consistently higher than equivalent values derived from the direct question equations. The difference may have occurred for a number of reasons. First, responses to the direct questions may be biased downward toward 3 dollars as this was the price paid for the urban permit and serves as a benchmark figure. Second, values asked for the 5-dollar auction begin at 5 dollars and increase in increments of 5 dollars, hence, values for the auction may be biased upward. Third, when anglers are asked to set their own price as they are with the direct question, the values may be lower than if they are asked simply to respond yes or no to a stated price--it is easier to agree with the interviewer than to think of a value on one's own. Lastly, interviewer error may cause upward bias in the answers to the 5-dollar auction. Salesmanship or a change in vocal tone

may coerce the interviewee to increase his value to a level higher than what he really would be willing to pay.

We conclude that unless the interviewer and interviewee can afford to spend a great deal of time, carefully working an auction in small increments, that direct questions on willingness-to-pay are more efficient, and probably elicit a more accurate response.

Parenthetically, when results of the 5-dollar auction are evaluated for "optimum" prices in order to collect the maximum revenue, the adult price is almost always $10 per permit, the juvenile price is always $5 per permit, and maximum collectable revenue is $31,070 with only 4,400 permits sold for the year. Increased revenue is implied over the direct question estimates ($30,790 compared with $25,589), but permits purchased decrease to 4,400 compared to 10,285. Even if the higher permit values are correct, the higher prices and reduced use does not appear equitable for a public program aimed at juveniles, minorities, and low income families.

Willingness-to-Sell

The concept of willingness-to-sell may also be interpreted as a measure of value. The question was asked: "What is the minimum amount for which you would sell your Urban Water Fishing permit to someone else if you could not buy another one for six months?" In terms of welfare theory, the question asks the compensation required to give up something for which you have property right without moving to a lower welfare position. Since you would either have the permit or not (no intermediate adjustment on your part would be possible), the concept is that of compensating surplus (Randall, 1977; Martin, Tinney and Gum, 1978). Obviously, the willingness-to-pay

measures are constrained by the person's income. Willingness-to-sell is not so constrained.

Answers to this question varied from slightly lower than the permit price actually paid (where the permittee was disappointed in the fishing program), to infinity where the person simply refused to sell. Obviously the infinite price answer would not be correct in a real market situation, but these answers and answers specifying noninfinite but quite high priced indicated a significant consumer value to the program when income was not a constraining factor. While demand curves derived from this question are not reported herein, they are greatly higher than the willingness-to-pay curves. This fact is relevant for a public program aimed at juveniles, minorities and low-income families.

APPENDIX B

URBAN FISHING--AN INFERIOR GOOD

An inferior good is defined by economists as a good for which the demand decreases as income rises. Thus, an inferior good is a product that would be purchased in relatively greater quantities by poor people than by wealthy people. Beans are a common example.

To test the hypothesis that urban fishing is an inferior good, willingness-to-pay and willingness-to-sell were regressed stepwise against these variables: estimated income for the angler's occupation, average income of the area is which the angler lived, the difference between estimated income of the angler and area average income, whether or not the angler was employed, whether or not the angler was a student, and whether or not the angler was on welfare. The three income variables were entered as continuous variables. The three income related variables of being on welfare, being unemployed, and having student status were entered as dummy variables--one if the variable applied, and zero otherwise.

Negative signs on the coefficients of the three income variables would indicate that urban fishing is an inferior good. For willingness-to-pay, negative signs mean that as income rises, willingness-to-pay for an urban fishing permit drops. Negative coefficients on income variables for willingness-to-sell indicates that urban fishing is of less value to wealthier anglers than to poorer anglers.

Dummy variable coefficient signs should show the reverse. For example, if the sign of the welfare variable coefficient were to be positive, then an angler would be willing to pay (or sell for) more if he were on welfare than if he were not. Only adult willingness-to-pay (value to the angler within his income constraint) and adult willingness-to-sell (value to angler given no income constraint) were analyzed.

Area income (the mean income of the area in which the angler lived) was taken from data found in Inside Phoenix, 1978 and Tucson Trends, 1978. Nearly 75 percent of the time, the coefficient on area income was negative, indicating that as the mean income of an angler's area of residence increases the angler's willingness-to-pay or -sell decreases.

Individual income estimates were derived from income estimates for specific occupations broken down by national regions (U.S. Department of Labor). Occupation of the angler was taken from the questionnaire. As was the case for area income, estimated individual income upheld the inferior good hypothesis of urban fishing 75 percent of the time. There was no multicollinearity between individual income and area average income.

The third direct income measure was the difference between individual income and area income. If this variable was positive an individual was living in an area where the mean income was lower than his. If the variable was negative the individual was wealthier than average. Consequently, if the sign of the coefficient is negative, then a relatively wealthier angler would be willing to pay less than a relatively poorer angler and urban fishing would again be considered an inferior good. Eighty percent of the time, the coefficient on this difference variable was negative.

Results from analysis of the three income variables supports the hypothesis that urban fishing is an inferior good. However, 75 percent of the time the coefficients of the three dummy variables apparently indicated that urban fishing is a normal good. The results appear mixed. However, students may have relatively high incomes relative to their opportunity costs for time. The same could be true for the unemployed and those on welfare. Income certainly is the dominant variable. We conclude that the inferior good hypothesis is probably true. Thus, an argument for public subsidy of urban fisheries can be made on grounds of distributional equity.

APPENDIX C

QUESTIONNAIRES

(Yellow Questionnaire)
University of Arizona
and
Arizona Department of Game and Fish
Urban Lakes Study

(1.) Lakeside_____ Chaparral_____

(2.) Date___/___/___/ Time/___/___/___/___/
Mo. Day Year M N AN E

/ S / M / T / W / T / F / S /

(3.) Urban Waters Fishing Permit Number_____

4. Resident_____ Nonresident_____

Sex_____ Age_____

Anglo_____Mexican/Indian_____Oriental_____Black_____

Local Address_____Zip_____

Your Occupation_____

(or for anglers under 14)

_____ _____
(father's occupation) (mother's occupation)

5. How did you hear about the Urban Lakes Program?

a) Read about it in the paper___
b) Heard about it from friends, relatives or park personnel___
c) Heard about it on radio or TV___
d) Didn't hear about it until I got to the lake___
e) Read sign posted at the lake___

(6.) Since July 1st, 1977, how many times have you fished here?_____
or
How many times have you fished here since I last interviewed you?

7. How many times did you fish here in the year previous to July 1st, 1977?_____

8. Since July 1st, 1977, how many times have you gone fishing in other places?___

or

How many times have you gone fishing elsewhere since I last interviewed you?___

9. How many times did you fish in other places in the year previous to July 1, 1977?___

10. How far do you live from the lake?___miles or ___blocks

11. How did you get to the lake?
___car
___bus
___bicycle
___walk

12. Are you here fishing by yourself or as part of a group?

____self ___group ___number in group

13. Would you have come to the park today if you weren't going to fish? ___yes ___no

If yes, other reasons_____

14. If you weren't fishing here today, what would you probably be doing?

_____

15. How long have you fished here at the lake today? ___hours ___minutes

16. How many of each kind of the following fish have you caught here today? How many of each have you thrown back?

	Total Caught	Thrown Back
Tilapia		
Carp		
Catfish		
Trout		
Bass		
Bluegill		
Crappie		
Bullhead		
Other		

17. Of all these kinds of fish, which is your favorite to catch?

_____

18. Which is your second most favorite? _____

19. Which is your favorite to eat? _____

20. (If angler is under 14) Did you buy your Urban Waters Fishing Permit with your own money or did someone buy it for you?

___Own ___Other

21. (If angler is over 14) Would you buy an Arizona State Fishing License if there was no urban lake program?

___Yes ___No ___Pioneer License

22. Would you but a trout stamp if there was no urban lake program?

___Yes ___No

23. What is the most amount of money you would pay for your six month Urban Water Fishing Permit rather than not fish here at all? (In addition to the regular fishing license if angler is 14 or over)

$_____

24. If the limit on your favorite fish were twice as high, what is the maximum amount you would pay for your six month Urban Waters Fishing Permit rather than not fish here at all?

$_____

25. If the lake wasn't stocked, like last year, what is the maximum amount you would pay for your six month Urban Waters Fishing Permit?

$_____

26. What is the minimum amount that you would sell your Urban Waters Fishing Permit to someone else if you could not buy another one for six months?

$_____

27. Would you rather have the Game and Fish Department stock fish here of spend the same amount of money to stock trout in the White Mountains?

$_____

28. Would you rather have the Game and Fish Department stock fish here or spend the same amount of money to stock trout in

____Urban Lake

___Parker and Pena Blanca Lakes (for Tucson anglers)

___Canyon Lake and Salt River (for Scottsdale anglers)

29. Do you have any comments about the Urban Lake Fishing Program?

(Green Questionnaire)
University of Arizona
and
Arizona Department of Game and Fish
Urban Lakes Study

(All questions on this questionnaire were identical to those on the "Yellow Questionnaire" except for questions 23, 24 and 25. These alternate questions are reproduced below.)

23. If necessary, rather than not fish here at all, would you pay--
$5, - $10, - $15, - $20
(circle one)

for your six month Urban Waters Fishing Permit?

____Yes ___No

24. If the limits on your favorite fish were twice as high, would you pay--
$5, - $10, - $15, - $20, - $25
(circle one)

for your six month Urban Waters Fishing Permit?

____Yes ___No

(ask $5 more than in question 23 if they said yes to 23; ask same number if they said no)

25. If the lake wasn't stocked, like last year, would you pay--
$5, - $10, - $15, - $20
(circle one)

for your six month Urban Waters Fishing Permit?

___Yes ___No

(ask same number as in question 23 if they said yes to 23; ask $5 less or $1 if they said no)

Arizona Game and Fish Department

P. O. Box 9099

Phoenix, Arizona 85068

942-3000

Dear Mr/s:

The ARIZONA GAME AND FISH DEPARTMENT is currently evaluating the Urban Fishing Program that was just completed in Scottsdale and Tucson. Our records indicate that you purchased a Chaparral/Lakeside Urban Fishing Permit for the period 1 July 1977 to 31 December 1977, but did not obtain a new one for 1 January 1978 to 30 June 1978. We are interested knowing why you did not buy one for the second six months.

Your answers to the following questions will be used to determine if there is a need and desire for this type of fishing program. Your cooperation will greatly appreciated.

Sincerely,
Fisheries Research
Arizona Game and Fish Department

1. Did you buy a regular state fishing license for 1978?
___YES ___NO

2. Although you did not buy an urban permit during the second period (1 Jan. - 30 June 78), would you buy one in the future if the program were expanded to include other public park lakes in the Phoenix/Tucson metropolitan area?
___Yes ___NO

3. I did not buy a second urban fishing permit for the following reason(s): (please X)
___a. I did not enjoy fishing in the middle of the city.
___b. I did not like the kinds of fish stocked.
___c. The fishing success was not good enough to warrant going back.
___d. The price of the permit was too high.
___e. There were too many people at the park each time I fished.
___f. The lake was too far away from my home.
___g. I did not have transportation to the lake.
___h. I did not have time to go fishing.
___i. I did not like the part where the lake was located.
___j. Daily limit was too small.
___k. I have moved from the area.
___l. Other reasons--please explain_____
_____

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