

AN ABSTRACT OF THE THESIS OF

Nancy E. Smith
(Name)

for the Master of Science
(Degree)

in Agricultural & Resource Economics presented on June 6, 1980
(Major) (Date)

Title: A Comparison of the Travel Cost and Contingent Valuation

Methods of Recreation Valuation at Cullaby Lake County Park

Abstract approved:

Redacted for privacy

H. H. Stoevener

While there are many people who feel it is impossible to place a monetary value on a recreation resource, economists argue that not only is it possible to do so but also necessary because so many recreation sites are publicly provided. There have been various methods used to value non-market goods such as a recreation resource, but the methods being used today are still in a changing process. The objective of this thesis is to use and compare two of the most popular means of valuing a recreation site. The two methods are the contingent valuation method (direct questioning of willingness to pay) and the travel cost method. The site to be valued is Cullaby Lake County Park near Astoria, Oregon.

Contingent valuation attempts to discover people's willingness to pay for use of the recreation site by "selling" annual passes for use of the site. Through summation of all individual's willingness to pay, a value for the recreation site is calculated. The travel cost method estimates a demand curve by asking users about their travel expenditures and assuming that people would react to an on-site price increase in the same manner as they would to an increase in travel expenditures. The

demand curve estimated in this thesis divides users into distance zones and uses zone averages for all the variables. The dependent variable is visits per thousand population for each zone. The independent variables are travel costs (as a price proxy), income, and one-way distance traveled to the site (to represent travel time). The estimate of site value is derived through integration of the consumers' surplus area underneath the demand curve and above the price line.

Value estimates derived by the two models show a wide divergence. The travel cost estimate is seven times larger than the contingent valuation estimate. Part of the reason for this discrepancy lies in the fact that the methods were estimating values for two different goods. A benefit estimate of a watershed development project on Cullaby Lake was desired. The contingent valuation method is flexible enough to allow estimation of the benefits attributable to only the improvements made on a natural lake. However, the travel cost model does not have this flexibility and will give a value for the lake as well as for the project improvements.

While this thesis does not prove that one method is superior to the other, it may be an important contribution to the literature. Which model (if either) should be chosen to estimate recreation benefits may depend on exactly what it is that one is attempting to value.

A COMPARISON OF THE TRAVEL COST AND
CONTINGENT VALUATION METHODS OF RECREATION VALUATION
AT CULLABY LAKE COUNTY PARK

by

Nancy E. Smith

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Science

Completed June 1980

Commencement June 1981

APPROVED:

Redacted for privacy

Professor of Department of Agricultural & Resource Economics
in charge of major

Redacted for privacy

Head of Department of Agricultural & Resource Economics

Redacted for privacy

Dean of Graduate School

Date thesis is presented June 6, 1980

ACKNOWLEDGEMENTS

The author is indebted to many persons for advise and assistance in the preparation of this thesis. In particular, debts of gratitude are due to:

Dr. Herbert H. Stoevener for his advise and guidance as a major professor and for his invaluable insights into performing research.

Drs. Roger Kraynick and Jim Whittaker for their remarks and observations on various portions of my research.

The personnel in the Douglas and Union County Parks Departments and the Clatsop County Road Department for their cooperation and aid in gathering data.

Dodi Snippen and Nina Zerba for their help in typing the thesis.

Finally, Marty for his patience and understanding during my years in graduate school.

TABLE OF CONTENTS

		Page
I.	INTRODUCTION	1
	Problem Statement	1
	Objectives	3
II.	A THEORETICAL FRAMEWORK	5
	Review of Early Models	5
	Current Travel Cost Methodology	12
	Current Direct Questioning Methodology	15
III.	EMPIRICAL PROCEDURES	19
	The Study Area	19
	Adaptation of Contingent Valuation Model	21
	Questionnaire Design	22
	Pretest	23
	Survey Methods	24
	Benefit Estimation	25
	A Departure from the Described Model	26
	Use of the Travel Cost Model	27
	Model Formulation	27
	Estimation of Benefits	32
	Estimation of User Population	35
IV.	STATISTICAL RESULTS	37
	Estimation of User Population	37
	Contingent Valuation Model	38
	Travel Cost Model	41
	Choosing a Model	41
	Estimation of Benefits	46

	Page
V. COMPARISON OF THE TWO MODELS	48
Divergence Between Empirical Estimates	48
Comments on the Contingent Valuation Model	51
Comments on the Travel Cost Model	53
The Two Methods in Use	54
VI. SUMMARY AND CONCLUSIONS	58
Results	58
Conclusions	59
Implications for Future Research	60
BIBLIOGRAPHY	62
APPENDIX A	64
Questionnaires	
APPENDIX B	73
Distance Zones	
APPENDIX C	76
Scattergrams of Residuals Against Independent Variables	

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1.	Visitation Rates Versus Travel Costs	9
2.	Demand for Visits from Increases in Travel Costs	11
3.	Net Revenue to a Non-Discriminating Monopolist	33
4.	Net Revenue to a Perfectly Discriminating Monopolist	33
Appendix Figures		
5.	Map of Travel Cost Distance Zones - Five Zones Defined	75

LIST OF TABLES

<u>Table</u>		<u>Page</u>
I.	Visitation Rates for Distance Zones	8
II.	Expected Total Visits From Various Price Increases	10
III.	Willingness to Pay by Activity and Family Status	40
IV.	Results of Four Forms of the Regression Model	43
V.	Elasticities of the Independent Variables	45
Appendix Table		
VI.	Travel Cost Zones Defined by Distance, Income, and Family Status	74

A COMPARISON OF THE TRAVEL COST AND
CONTINGENT VALUATION METHODS OF RECREATION VALUATION
AT CULLABY LAKE COUNTY PARK

CHAPTER I

INTRODUCTION

Problem Statement

Estimation of the economic benefits accruing to outdoor recreation resources has been difficult at best and was not even attempted until the late 1950's. Since then, various methods have been tried with varying degrees of success. At this point, there are several approaches for valuing recreation areas rather than one well defined, generally accepted procedure. The reason for this difficulty in devising a well accepted procedure to value recreation areas lies in the fact that most outdoor recreation sites are publicly supplied. There is little or no private market in which economists can observe consumers demanding quantities of recreation at various prices.

Valuing recreation sites has also come up against social obstacles. Many feel that it is impossible, even morally wrong, to try to place a dollar value on recreation. It is said to be priceless, that no dollar figure can account for the aesthetic or psychological experience that recreation provides. However, many goods and services are valued solely on the basis of the aesthetic or psychological experience associated with them. For example, economic valuation of most forms of art (music, paintings, ballet, etc.) is accepted.

In spite of these difficulties, economists argue that not only is it possible to place a monetary value on recreation areas, but there is also a need to do so. This need arises because of a lack of information about the optimal level of resources that should be allocated to providing recreation sites. For private goods, the levels of resource allocation for goods are determined by aggregate demand and supply conditions in the marketplace.

These demand conditions are influenced by (1) the price of the good, (2) consumers' tastes and preferences, (3) consumers' income, (4) availability of substitutes, (5) prices of substitutes and complements, (6) the number of consumers, and (7) consumers' expectations of future prices. Supply is determined by input prices, output prices, and the prices of substitutes in production. The prices that people are willing to pay to obtain a good rather than to go without it can be observed in the market. Prices, in turn, influence producers' decisions on levels of production. This observation of prices people are willing to pay for various quantities of a good is not possible for public goods such as a recreation area because there is little or no price charged per visit. Because many outdoor recreation facilities are publicly provided, these public expenditures should be examined.

The costs of constructing a recreation facility are known but some estimate of the benefits arising from these recreation areas is necessary for purposes of comparison between these benefits and costs. If the costs of construction, operation, maintenance, and the opportunity costs of investment outweigh the benefits from recreational use, it would be more efficient to reallocate those public funds to an alternate site, or

to an alternate purpose. If costs outweigh benefits for all possible public projects, then the public may want to consider reallocating those funds to private sector investment.

Outdoor recreation is much the same as other forms of recreation that are purchased in the market. Similar to movies, bowling, or playing tennis at a private club, everyone has his own limit as to how much money or other goods he is willing to give up in order to participate in outdoor recreation. Thus, the problem in valuing recreation areas lies in finding a method to simulate market behavior that forces individuals to name their 'price' for outdoor recreation areas.

Objectives

There are a variety of methods to value recreation sites. The objective of this study is to examine the two most widely used valuation methods. The two methods to be used are known as the travel cost method (TCM), and the direct questioning of willingness to pay which will be called the contingent valuation method (CVM). Using both models to arrive at separate valuations of the same recreation site will enable comparison of the two models in terms of (1) differences in the absolute quantities of benefits estimated, (2) flexibility of each model in adapting to peculiarities of a specific recreational evaluation assignment, and (3) a comparison of problems associated with the use of each model in terms of costs, time, and complexity. This last comparison may be of interest to public agencies who must choose a method to value the benefits of recreation from actual or proposed water development projects.

The organization of this thesis will proceed as follows. First, some early methods of estimating recreation benefits will be mentioned, and the state of the art of the travel cost and contingent valuation methods will be described. Next, the study area, survey design, and adaptation of the two models to the study area will be discussed.

CHAPTER II

A THEORETICAL FRAMEWORK

Review of Early Models

Valuation of publicly supplied recreational services centers around the idea of attempting to discover what recreationists would be willing to pay for the use of the recreation site. Valuation can be done through use of direct or indirect methods. Indirect methods use observations of recreationists' activities or expenditure patterns to impute a willingness to pay value. Direct methods question the recreationist about what he would be willing to pay to use the recreation site. Among the various indirect methods that have been used to value recreation, those that have been most promising are ones that attempt to construct a demand schedule for the recreation site. The demand schedule estimates the quantity of visits to the site that will be taken at alternative prices.

Two early indirect methods that were not successful were the "cost" method and the gross expenditures method. Using the cost method, the National Park Service (1950) contended that "...A reasonable estimate of the benefits arising from a reservoir itself may be normally considered as an amount equal to the specific costs of developing, operating, and maintaining the recommended facilities..." This is circular reasoning, thus not acceptable. The gross expenditures method reasons that recreationists spending money to recreate must get at least as much value from it as their expenditures, otherwise they would not have made

the expenditure. However, if the recreational opportunity was no longer available that same money would be spent elsewhere, and the amount of the loss would not be equal to the total expenditure made.

The indirect method of measuring recreation benefits which has been the most promising and widely used thus far is the travel cost method. It can be traced back to Hotelling (1949) in a letter to the U.S. National Park Service in which he used the idea of concentric zones around the recreation area. The costs of traveling to the site from all places in a particular zone are approximately the same and can be used as a price variable in a demand schedule, with the number of per capita visits from each zone being the quantity variable.

Clawson (1959) utilized Hotelling's idea of the concentric zones in an empirical study of several national parks. He developed a demand schedule of participation rate versus travel cost relationships. Using information collected from users on distance traveled, he defined several concentric zones. Users were placed in one of the distance zones, and the number of per capita visits from each zone was calculated. Travel costs for each zone were calculated by multiplying the distance from the middle of the zone by an average cost per mile. Per capita visits were then plotted against travel costs. From this response function a demand curve was estimated by increasing travel costs and calculating the decrease in number of visits that would be made. Estimating visits for various increases in travel costs was based on the assumption that recreationists would react to an on-site price increase in the same manner that they would to the increase in travel costs. This method of deriving a demand curve for the recreation site can be demonstrated by an example.

From an on-site sample survey, data are gathered on the distance users travel to get to the site. For this example, four distance zones are defined, and the population of each zone is found. Users are placed in one of the four distance zones and visit rates per 1,000 population are calculated. Using distance from the middle of the zone to the site and a cost of \$.10 per mile, the travel cost per zone is calculated. The results are shown in Table I and Figure 1.

Next, the demand curve must be derived from this information on visitation rates. Increases in travel costs are used to simulate various prices for on-site recreation. From these increases in travel costs and the visitation rates in Table I, the demand schedule of Table II and the demand curve of Figure 2 are generated.

Clawson's study stimulated research into using this travel cost method. Studies done since Clawson have attempted to deal with some of the drawbacks of the travel cost method. Some of the problems that have been dealt with include consideration of income, non-homogeneous preferences of users, variations in activities, the variety of substitutes available to users of different zones, and time costs of overcoming distance (Brown, et al, 1964 and 1973; Clawson and Knetsch, 1966; Ward, 1980)

The direct method of estimating demand was perhaps first empirically used by Knetsch and Davis in 1966. For this method, recreationists are asked how much they would be willing to pay for the use of a certain recreational facility. These individual willingness to pay values are summed across the sample and expanded to the population of users to derive a measure of recreation benefits. In Davis' study of

TABLE I. VISITATION RATES FOR DISTANCE ZONES

Zone	Distance (miles)	Travel cost (\$)	Visits per 1,000 population	Population in 1,000's	Total Visits
1	0-50	2.50	4	2	8,000
2	51-100	7.50	3	5	15,000
3	101-150	12.50	2	8	16,000
4	151-200	17.50	1	10	10,000

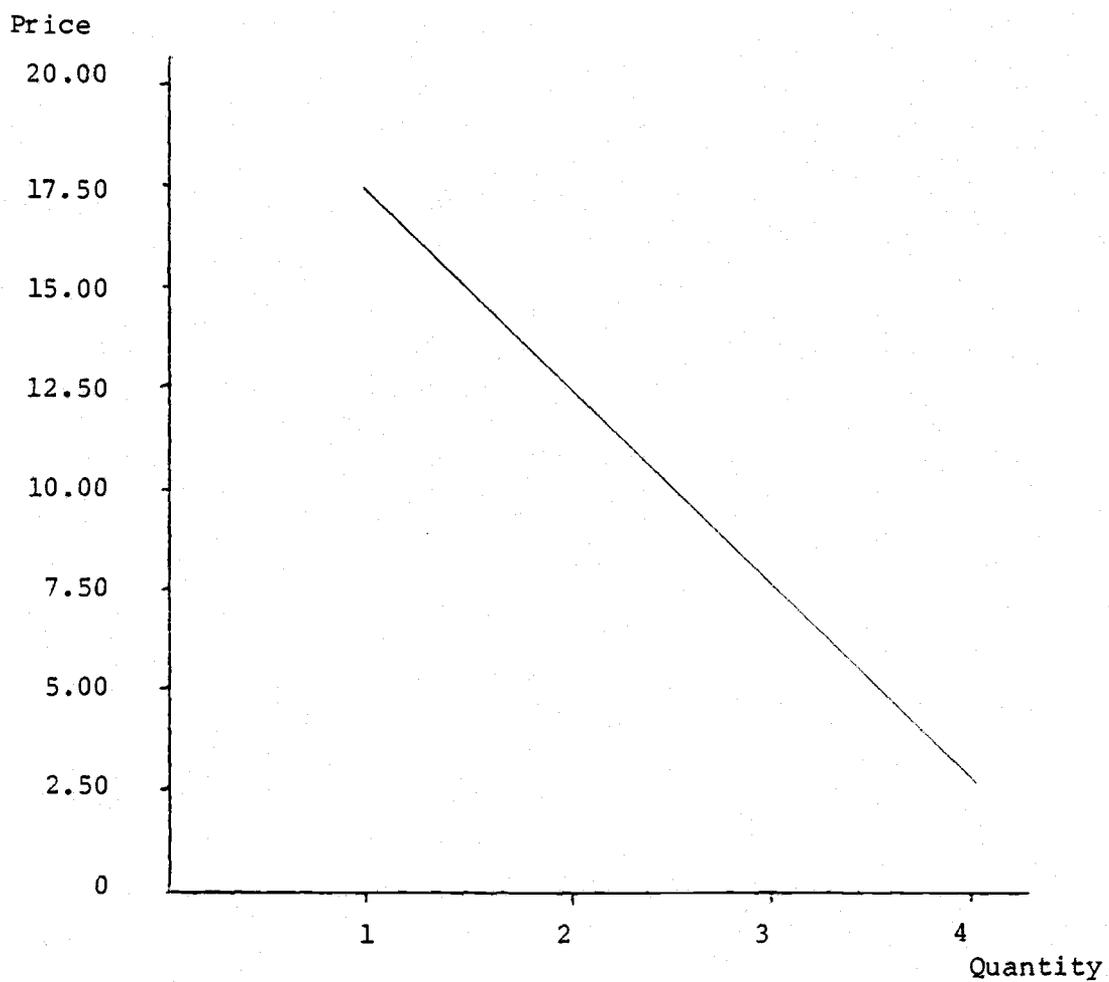


Figure 2. Visitation rates versus travel costs.

TABLE II. EXPECTED TOTAL VISITS FROM VARIOUS PRICE INCREASES

Increase in travel cost	Expected visits
\$ 0	49,000
5.00	24,000
10.00	9,000
15.00	2,000

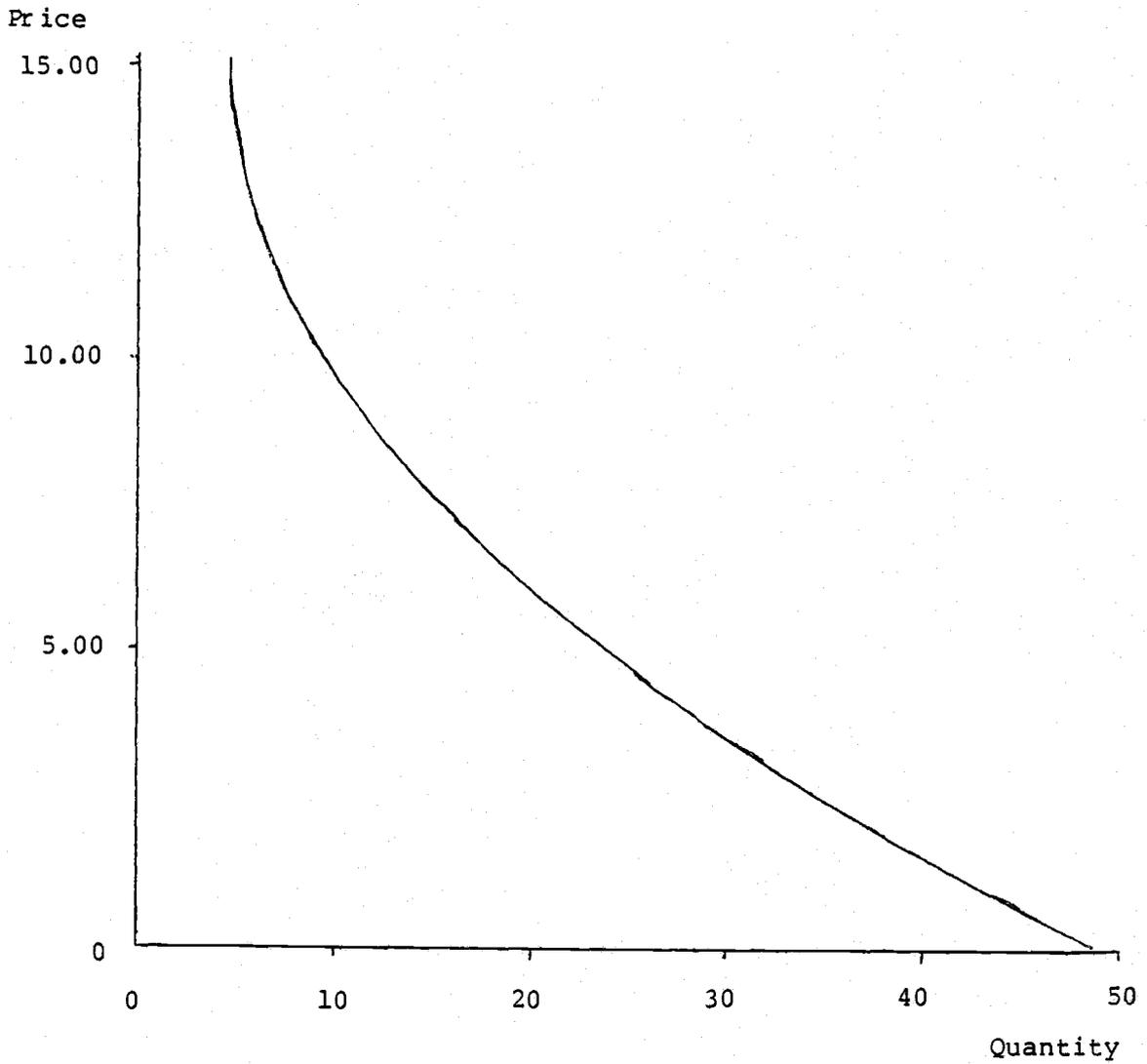


Figure 2. Demand for visits from increases in travel costs.

the Maine woods in the early 1960's (Knetsch and Davis, 1966) he asked users about their willingness to pay for recreation along with making use of a Hotelling-Clawson travel cost approach to estimate benefits. However, many problems arose with evaluating the direct method. This may have been attributable to poor survey design and sampling methods. For many years little was done with use of this direct willingness to pay method. In recent years work has been done to improve this method with some favorable results (Randall, 1974 (a) and (b); Randall and Brookshire, 1978; Brookshire, et al, 1976).

Current Travel Cost Methodology

The first empirical usage of the travel cost method, done by Clawson in 1959, used only information collected from users on distance traveled. A price proxy was calculated simply by multiplying distance traveled by a cost per mile. The monetary value of the site was then estimated by multiplying projected number of visits times these various increases in recreational costs.

Expanding the Hotelling-Clawson model in 1964, Brown et al did a study of 1962 Oregon salmon-steelhead sport fishing. Other expenditures such as food, lodging, and bait were included with automobile travel costs to provide the price variable which was then called transfer costs. They made an attempt to study the influence of other variables such as the number of fish caught, variable cost per day, and number of days taken. To study the effect of income on the number of visits made, the sample data were further stratified into seven income levels within

each distance zone, and income was included as an independent variable in the demand equation. Income was found to have a correlation with variable cost per day and to influence per capita catch and days taken. Similar to Clawson's data, the estimated demand schedule using income and transfer costs as variables showed the amount of fishing that would be done at various possible prices. That point which would maximize the return to a non-discriminating owner of the fishery resource was chosen to estimate the economic benefit and was compared to an estimate based on the total consumers' surplus area underneath the demand curve.^{1/} The latter estimate of total consumers' surplus was over twice the estimated return that could be realized by the non-discriminating monopolist.

In 1966, Clawson and Knetsch argued that the total area under the demand curve should be used to measure the economic value of the resource. This area represents the difference between what the user would be willing to pay to use the resource and what he actually does pay (in the case of free access recreation sites). This consumers' surplus area under the demand curve would be the return a perfectly discriminating monopolist would obtain.

Until recently, no attention was given to the role of time required to get to and from the site and to participate in outdoor recreation. For those who have a lot of time, this may not be important. However, for many people, time is a more severe constraint than income on the

^{1/} "The excess of the price which he would be willing to pay rather than go without the thing, over that which he actually does pay, is the economic measure of this surplus satisfaction. It is called consumers' surplus." (Marshall, 1920, p. 124)

decisions of where and how much recreation to take, and thus is an additional cost. This negative effect of time is not explicitly included in the travel cost price variable. If this cost of travel time is not included somewhere else in the model, the consumers' surplus value may be underestimated (Cesario and Knetsch, 1970).

Attempting to include this time effect as well as other variables such as income, hunting success and hunting experience, Brown et al (1973) did a study of the Oregon big game resource. They included one-way distance traveled as an independent variable to explain the negative impact of travel time. Also, instead of using zone averages for the variables, individual observations were used. They argued that using individual observations can produce a statistically better model because of the increase in the number of observations and because of the possible reduction in correlation between two of the independent variables, transfer costs and distance.

Also using individual observations, Gum and Martin (1975) calculated values for recreation sites in the entire state of Arizona. They obtained significant parameter estimates for separate time and money cost variables. Socioeconomic variables were also included as zone averages, and they concluded that failure to include such variables which vary widely among individuals may bias the cost coefficients. Thus, when using an individual observations model, there will be greater data requirements. Lastly, prices of substitute recreation attractions within Arizona were included as a separate explanatory variable. Larger resource value estimates were obtained than in previous studies, as large as

estimates of values from the gross expenditures method. However, it seems that if a model includes the values of substitutes, with more substitutes available, the value of any individual site should be less.

Current Direct Questioning Methodology

Direct questioning measures attempt to estimate the benefits of a public good by simulating a hypothetical market and eliciting willingness to pay values. The problems encountered by Knetsch and Davis in 1965 when using direct questioning of willingness to pay have generally been attributed to survey design and choice of payment vehicle. Recent uses of this direct questioning method have attempted to overcome these problems.

When arguing for use of this method, Randall and Brookshire (June 1978) discuss the Hicksian measures of consumers' surplus. This measures the change in consumers' surplus as a result of a change in provision of a public good. Consumers will be willing to pay (or accept compensation) for a change in the level of provision of a public good in order to achieve a higher level of welfare (or avoid a loss in welfare). Thus, in the case of provision of a new recreation site, the consumers' willingness to pay (WTP) for use of that site can be used as a measure of the increase in this welfare level. The WTP values (increase in welfare levels) for all potential users of a proposed recreation site can be summed to find the benefits that would be attained from an increase in provision of such a public good. Because consumers are asked to make a decision contingent upon the existence of an actual market for the public

good, Randall and Brookshire (June 1978) call this direct questioning of willingness to pay the contingent valuation method (CVM).

Randall and Brookshire (June 1978) suggest using iterative bidding to elicit WTP responses from potential users of a proposed recreation site. First, the hypothetical market must be described in detail. This should include a description of alternate levels of provision of the public good (using photographs of similar areas if possible), creation of a hypothetical market (assuring that all users would have to pay equally), and specification of a relevant payment vehicle. Second, the respondent reacts to various prices, indicating whether he would pay for the good rather than go without it, until the price at which he is indifferent is found. In this way, similar to the respondent's typical market experience, he is presented with a price for a specific good and must decide whether or not to purchase it. In addition, alternative levels of the public good may be posed so that incremental values can be estimated.

Once a sample of potential users has been interviewed, their WTP values can be summed across the sample. This sample WTP value is then expanded to the relevant population to find the benefits (increase in welfare levels or consumers' surplus) that would be realized from alternate levels of provision of the public good.

Of utmost importance when using the CVM is survey design. The WTP question must clearly state the alternate levels of public good provision. The payment vehicle specified must be one with which respondents can identify, such as an increase in hunting license fees for the right to hunt game. If the population being surveyed has difficulty relating to

the payment vehicle, there may be a problem with protest responses. Refusal to bid positive amounts for the public good may not indicate a zero valuation of the good, but a protest against the hypothetical market. To help alleviate this problem, the WTP question should include some exclusionary mechanism so that respondents are not likely to give zero values, thinking they can find some way to use the public good as a "free rider." Pretest of the questionnaire should be done to detect problems with the payment vehicle used in the WTP question.

A study done in 1978 by Bishop and Heberlein (1979) of goose hunting in the Horicon Marsh in Wisconsin for which a limited number of permits were issued used three methods of valuation. The first two methods are based on direct questioning of willingness to pay, and the third was a travel cost approach. For the first method, prior to the opening of the goose hunting season they attempted to buy permits from those who had received them, varying the amount of actual cash money offered. Secondly, they surveyed others who received permits, sending them hypothetical offers to purchase their permits. For those who did not receive permits, hypothetical offers were made to sell one to them. Thirdly, a mail survey was done at the end of the season in order to collect data for the travel cost approach. Their results suggested that the hypothetical willingness to pay would be a lower bound for valuation of a resource and hypothetical willingness to sell an upper bound. Results from the travel cost method showed lower values than the direct willingness to pay or sell methods.

Some other empirical case studies include household substitution effects (Blank et al, 1977; Brookshire et al, 1977) in which consumers

are observed recombining public and private goods when faced with changes in the availability of a public good. This information is analyzed to infer the value of the public goods. Other techniques attempt to directly obtain value information through open-ended valuation questions (Hammack and Brown, 1974) and iterative bidding techniques (Randall et al, 1974 (a) and (b); Randall and Brookshire, 1978).

CHAPTER III

EMPIRICAL PROCEDURES

The Study Area

The recreation site used to estimate benefits by the two methods is Cullaby Lake County Park near Astoria, Oregon, in Clatsop County. Cullaby Lake is a natural lake on the Skipanon River, both of which experienced wide fluctuations in water levels between the winter and summer seasons. In addition, the Skipanon River empties into Young's Bay, then into the Columbia River, which in turn empties into the Pacific Ocean. The changing tides of the Pacific also cause fluctuations in the water level in the lower Skipanon, just prior to its emptying into Young's Bay. Prior to 1964, fluctuations in seasonal and daily water levels caused flooding at Cullaby Lake while tidal fluctuations caused flooding on the banks of the Skipanon River. In 1964, a Public Law 566 small watershed development project was undertaken to install a tide gate at the mouth of the Skipanon, a middle structure to help control the river water level, a lake level control structure to stabilize seasonal lake levels, and to clear the river channel of brush and debris. Estimation of recreation benefits was part of a more comprehensive study being done on the costs and benefits of this P.L. 566 project. At the time that the Skipanon Watershed Workplan was written, the plan provided only for flood control. No thought was given to providing for recreation. There was already a 30 acre park, Carnahan Park, at the north end of Cullaby Lake, the land

for which had been donated to the county in the early 1940's. Carnahan Park has a small gravel boat ramp, picnic tables, pit-type toilets, fire pits, a fishing dock, and parking area. Because of the climate in Clatsop County, Carnahan Park receives most of its usage during the summer months. The major activities on the lake are warm water fishing, water-skiing, boating, swimming, and picnicking. In the late summer, the water level of the lake typically would go down, but it was still deep enough for all of the above mentioned activities.

Clatsop County is bordered on the west by the Pacific Ocean and on the north by the Columbia River. There are a number of parks in Clatsop County with camping, picnicking, and swimming facilities. Fishing is popular from private or charter boats in the river and ocean. However, with all of these water-based recreation resources so close, there is a shortage of non-turbulent, lake-type recreation available. Cullaby Lake is the only lake in the county where water-skiing is possible.

In 1962, a supplement was added to the Skipanon Watershed Workplan that provided for shoreline enhancement and new recreational facilities. River channel clearing and the dam on the lake were intended to enable drainage of the swampy land around the lake and to stabilize the lake level. A day use area was constructed along the west shore of Cullaby Lake. The county owns 165 acres along the west shore of Cullaby Lake, 50 acres of which was used for the Cullaby Lake County Park day use area. Project improvements included an access road, two parking lots, two boat ramps, a boat dock, boat basin, two sand-fill beaches with picnic shelters, two flushing latrines, drinking fountains, picnic tables, fire pits, playground equipment, and a large barbeque pit.

Recreation opportunities after completion of the project are much the same as before. Carnahan Park is still present on the north end of the lake, while Cullaby Lake Park is the newer area on the west shore. The main difference is in the quality and quantity of recreation now available. Along with warm-water fishing, a trout fishery was added. Water-skiing and boating were enhanced by a new, paved boat ramp and floats and the clearing of brush around the shore of the lake. A dredged out swimming area marked with buoys made swimming both safer and more easily enjoyed. The sand beaches and playground equipment provided new areas for children and adults to enjoy. The water system, latrine, drinking fountains, picnic tables, fire pits, large picnic shelters, and barbeque pit allow much more picnicking, especially for large groups, than is possible at Carnahan Park.

Adaptation of Contingent Valuation Model

Randall and Brookshire (June 1978) suggest using the CVM to estimate benefits of a hypothetical recreation site. Because a benefit estimate of an existing site was desired, this method had to be adapted for use at this particular site. This adaptation was made by questioning actual users of the site. Thus, responses were obtained from individuals who had experience with and knowledge of the site instead of asking the respondents to project themselves into a more hypothetical situation. Questioning those with first-hand knowledge should yield more accurate site valuations from users but would not allow for any option value from non-users.

Still, valuation by this method is based on a hypothetical market. Survey design is extremely important and personal interviews are a necessity. Additionally, the WTP question had to be adapted to question users about their valuation of the enhanced use (of an existing lake) made possible by the P.L. 566 project improvements.

Questionnaire Design

Questionnaire design is of critical importance when using Contingent Valuation. An attempt was made to keep the questionnaire short and to the point. The first part of the questionnaire attempts to establish a rapport between the interviewer and respondents and to discover use information by inquiring about the latter's frequency of trips made to the lake, the number of people in the party, and in what activities they participated. Next is the question about their willingness to pay, followed by one asking for their place of residence. If the respondent was from outside of Clatsop County, he was asked questions relating to expenditures made in the local area. The possibly threatening questions about education and income were left until the end. A copy of the questionnaire can be found in Appendix A.

The willingness to pay question is based on an annual pass allowing the purchaser unlimited use of Cullaby Lake recreation facilities for one year. Those who did not have a pass would be excluded from use of the site. An annual pass for a recreational facility is consistent with current practices of annual fees charged to belong to private recreational clubs, or to gain access to public swimming pools. Familiarity with this type of payment vehicle would make responses more reliable.

Two forms of the willingness to pay question were used, both of which are shown in Appendix A. The first is relatively long and describes the hypothetical situation of a lake with limited access and facilities, and then questions how much the respondent would pay for a pass if better access and new facilities, similar to those present at Cullaby Lake, were constructed. The shorter form of the question simply asked about the respondent's value for the park facilities. Asking the WTP question in these two ways was an attempt to discover if there is any advantage to one or the other form of the question.

Iterative bidding is used to arrive at the respondent's maximum price for an annual pass. Arbitrary starting prices are selected and varied systematically by using the table on page three of the questionnaire (in Appendix A). The respondent is asked if he would buy a pass if it cost the starting price. Depending upon a "yes" or "no" response, the price is then varied up and down until the maximum price which he would pay for the annual pass is reached.

Pretest

A pretest of the questionnaire was conducted to see how respondents would react to the questionnaire, especially the willingness to pay question, in an attempt to eliminate a possible source of bias. Randall and Brookshire (June 1978) suggest that if a pretest results in greater than 15 percent "protest" responses (a protest response against the payment vehicle rather than a zero value for the facilities), the questionnaire should be redesigned. Out of 17 completed questionnaires, there were two zero responses to the WTP question. Only one of those was a

protest response, giving a zero value because the respondent reacted negatively to the hypothetical payment vehicle. There were no objections to any of the other questions.

Survey Methods

In using CVM, the best way to find WTP is through questioning a random segment of the population, showing them photographs and describing a recreation area. For this study, it was necessary to discover the WTP of the population of users of a specific site. Questionnaires were to be completed during the 1979 summer months through personal interviews. There were no available estimates of the annual number of user days taken at Cullaby Lake which would indicate the appropriate sample size. In order to calculate the sample size necessary for a specified bound on the error of estimation, information on the population size and the standard deviation of the mean number of visits made is necessary. Because there was no such information available, it was arbitrarily decided that approximately 200 completed questionnaires should give a sufficiently large sample size.

Interviews were to be conducted on both weekends and weekdays and at various times of the day in an attempt to get responses from a cross section of users. A pattern was established that the interviewer was to follow for the selection of groups in order to obtain a random sample of all users at the site, rather than a predominance of users in one section of the park or of one type of user.

Users of Cullaby Lake County Park normally fall into one of two types of groups. One group consists of family members the other of a group of

friends. In the case of a family group, the head of the family answers the questions for the household. When a group of friends is approached, an individual was to be chosen to answer the questions on behalf of himself only. Thus when expanding the sample to the population, it will be necessary to keep in mind that the values of the WTP question apply to a family group in some cases and to an individual in others.

Because the majority of questionnaires would be filled out on weekends during the busy hours of the day, the sample would not be representative of the proportions of users in various activities. To enable correction of the sample for the actual percentages of users in the different activities, user counts were taken at various times of the day and all days of the week. Users were placed in one of three major activities: (1) fishing; (2) boating and skiing; (3) picnicking, swimming, and other activities.

Benefit Estimation

Benefits will be estimated from the willingness to pay for use of the park facilities by the sample user population. This is done by summing the WTP responses of the sample, then expanding that value to the estimated user population.

The sample WTP will be weighted by the activity participation rates and by a consideration of whether the response represents a family group or an individual. For a family group, the WTP response is representative of the number of users in the family; it is a group, not an individual response. For non-family groups, the WTP response represents the valuation of the respondent only. Thus, the willingness to pay for families

can be added to the WTP for individuals, and the sample size is the number of family users sampled (not the number of families surveyed) plus the number of individuals sampled. The sample WTP is found by the following:

$$\text{Sample WTP} = \Sigma \left[(\text{WTP}_{\text{FA}} \times P_{\text{A}}) + (\text{WTP}_{\text{IA}} \times P_{\text{A}}) \right] \quad (1)$$

where

F = family group

I = individual respondent

A = activity (F if fishing, B if boating or skiing, O if picnicking, swimming, or other activity)

P_{A} = activity participation rate.

In order to expand the sample to the user population, an expansion factor is found, and multiplied by the sample WTP using the following equations.

$$\text{Expansion Factor} = \text{User Population} \div \text{Sample Size} \quad (2)$$

$$\text{Total WTP} = \text{Sample WTP} \times \text{Expansion Factor} \quad (3)$$

A Departure from the Described Model

One problem was encountered during early observations of users at Cullaby Lake. During the summer, many local organizations hold large group picnics at Cullaby Lake County Park. It was not known how large a percentage of total use is attributable to these large group picnics. It was decided that a separate sample, with a modified questionnaire, would be taken. A copy of this questionnaire is also in Appendix A. Further-

more, when counts were taken of the numbers of people participating in various activities, large group picnicking was included as a distinct activity. The intention was to discover how many of the total number of users were large group picnickers and what their willingness is to pay for use of the facilities.

Use of the Travel Cost Method

The reasoning behind the travel cost methodology is the assumption that recreationists would react to an on-site price increase in the same manner as they would to an increase in travel costs to the site. The demand curve constructed through multiple regression reflects visitation rates as a function of site prices (estimated by the increases in travel costs). For this paper, the model using zone averages developed by Hotelling (1949) and Clawson (1959) will be used. Data for this model are obtained from the same questionnaire that was used for the contingent valuation model.

Model Formulation

In order to construct a model to estimate the demand for visits per year at Cullaby Lake County Park, those factors which determine demand for goods must be analyzed. An individual's demand for a good is influenced by (1) price of the good, (2) tastes and preferences, (3) income, (4) prices and availability of substitute and complementary goods, and (5) expectations of future prices. A model that attempts to estimate demand should include as many of these determinants as possible. The

model to be used will include travel costs (as a proxy for price) and income. Tastes and preferences as well as future expectations are difficult to include in the model, especially because variables that are to be used must be averaged across distance zones. Thus, tastes, preferences, and expectations are assumed to be uniform. Prices and availability of substitute recreation sites are also difficult to include in a zone averages model because they vary depending upon the origin of an individual within a zone. One-way distance traveled will be included in the model to represent the negative effect of travel time. This could possibly be considered as a cost (however it is not defined in terms of dollars). It is anticipated that there may be a problem with multicollinearity between one-way distance (travel time) and travel costs.

Fitting the regression model to the data is an attempt to find a relationship between visits made to Cullaby Lake and the variables that can explain the variations in demand for visits. Four functional forms of the demand equation will be tried and statistical tests will be performed to find the model with the best fit.

Variables to be included in the model are average values for each distance zone. Five distance zones have been defined in the State of Oregon for users of the Cullaby Lake County Park recreational facility near Astoria. The majority of users come from the first and fourth zones. In order to incorporate income into the model and to have more observation zones, the first and fourth distance zones are divided into low, medium, and high income groups. Zones are also divided to separate

family responses and single adult responses. In total, there are 18 zones defined, thus 18 observations.

When fitting the model to the data, the dependent variable used is number of trips taken annually per thousand population. This is computed by dividing the number of visits made to Cullaby Lake County Park in 1979 by users from a particular zone, by the zone population per thousand for that zone. The travel cost variable will be computed by the following equation to represent the price variable.

$$\text{EXP} = .17 (2 * \text{DIST}) + \text{N}(\text{LOD}) + \text{D}(\text{MLS}) + \text{FD} + \text{MSC} \quad (4)$$

$$\text{TC} = \text{EXP} \div \text{PPL} \div \text{DAYS} \quad (5)$$

where:

- EXP = expenditure per group per trip in dollars
- TC = travel costs per person per day in dollars
- DIST = one-way distance traveled in miles
- N = nights spent per trip
- LOD = amount spent per night on lodging in dollars
- D = days spent per trip
- MLS = amount spent per day on meals in restaurants in dollars
- FD = amount spent per trip on groceries in dollars
- MSC = amount spent per trip on any other miscellaneous items in dollars
- PPL = number of people per group
- DAYS = number of days spent per trip.

Seventeen cents per mile was chosen to calculate the travel cost equation because that was the rate the State of Oregon used to reimburse employees using private cars for business purposes during the summer of 1979. The State calculates this figure from the average cost, including maintenance of operating mid-size vehicles owned by the State motor pool. Thus, \$.17 per mile is assumed to be a fair representation of cost per mile for travel in a personal vehicle. No attempt was made to include a monetary value for the time spent traveling to the site because of the difficulty in defining a fair monetary value for a person's time spent recreating. Because of the negative relationship between price and quantity in a demand function, the travel cost coefficient is expected to have a negative sign.

Income was based on a scale from one to seven. The actual income figures included in the seven income strata are on page four of the questionnaire in Appendix A. The zone average income will be a number between one and seven, rather than a dollar figure. Because income varies positively with quantity demanded for normal goods, the income coefficient will be expected to have a positive sign (assuming recreation at Cullaby Lake County Park is a normal good).

One-way distance traveled will be used to represent the negative effect of travel time. Since round-trip distance is included in the travel cost variable, there may be a problem of multicollinearity between those two variables. However, inclusion of the negative effect of travel in price would mean assigning a dollar figure to time which may not be acceptable both because of the difficulty of agreeing on the dollar figure to use, and because of the fact that it is not an out-of-the-pocket

expenditure as are the other components of the price variable. Because of this, it seems the negative effect of time would be better included on its own, even though the problem of multicollinearity may arise. Because of the largely negative effect of travel time on quantity of visits taken, the coefficient is expected to be negative.

The zone averages model to be used will be as follows:

$$VPT_i = B_0 + B_1 TC_i + B_2 DIST_i + B_3 INC_i + u_i \quad (6)$$

where:

VPT_i = per capita trips per year (visits per 1,000 population per year)

TC_i = travel cost per person per day in dollars

$DIST_i$ = one-way distance traveled in miles

INC_i = income strata

B_j = parameter estimates $j = 0, \dots, 3$

u_i = stochastic error term

i = zone average value $i = 1, \dots, 18$

Of the possible algebraic forms that could be used, the linear demand model will be estimated first because it is the simplest form. It is anticipated that a linear model may not be best to fit a demand curve, but that an exponential function may fit the demand curve better because of its curvilinear, asymptotic property. This is because the price-quantity relationship of a linear demand curve indicates constant marginal utility, while an exponential function would indicate decreasing marginal utility. This exponential function ($Y = \exp^{(B_0 + B_1 X_1 + B_2 X_2)}$) will be used by means of logarithmic transformation of both sides of the equation.

Defining the variables the same as for the preceding model, the second demand model that will be used is the following log-linear form.

$$\text{LNVPT}_i = B_0 + B_1 \text{TC}_i + B_2 \text{DIST}_i + B_3 \text{INC}_i + u_i \quad (7)$$

A linear-log and log-log form of the same equation will also be used.

Defining the variables in the same way, these models are:

$$\text{VPT}_i = B_0 + B_1 \text{LNTC}_i + B_2 \text{LNINC}_i + B_3 \text{DIST}_i + u_i \quad (8)$$

$$\text{LNVPT}_i = B_0 + B_1 \text{LNTC}_i + B_2 \text{LNINC}_i + B_3 \text{LNDIST}_i + u_i \quad (9)$$

Estimation of Benefits

Clawson and Knetsch (1966) and Brown et al (1964) present two different methods for estimation of benefits. Both use the concept of 'net economic value' which Brown defines as the

"best estimate of the monetary value of the sport fishery resource which might exist if the resource were owned by a single individual, and a market existed for the opportunity to fish for salmon and steelhead. This net economic value would approximate the value of the resource to a single owner who could charge sport anglers for his permission to fish for salmon and steelhead" (p. 28).

The point on the demand curve that should be used to measure this value is the price that would give maximum net yield -- the price which a non-discriminating monopolist would charge. If one assumes the linear demand curve in Figure 3 for the recreation resource and if the revenue maximizing prices and quantity are found to be P_m and Q_m , then the net economic value would be the area $P_m \times Q_m$.

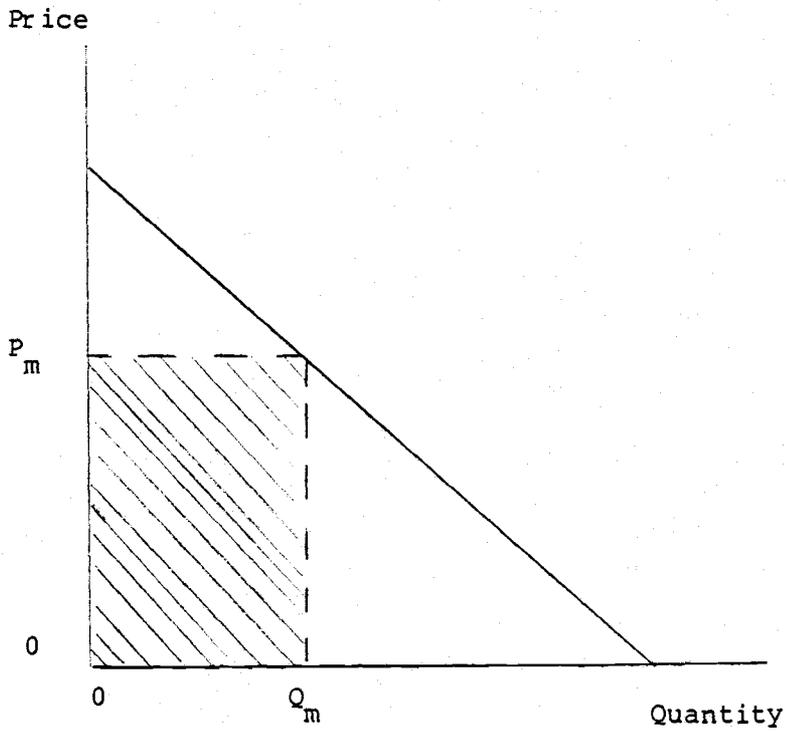


Figure 3. Net revenue to a non-discriminating monopolist

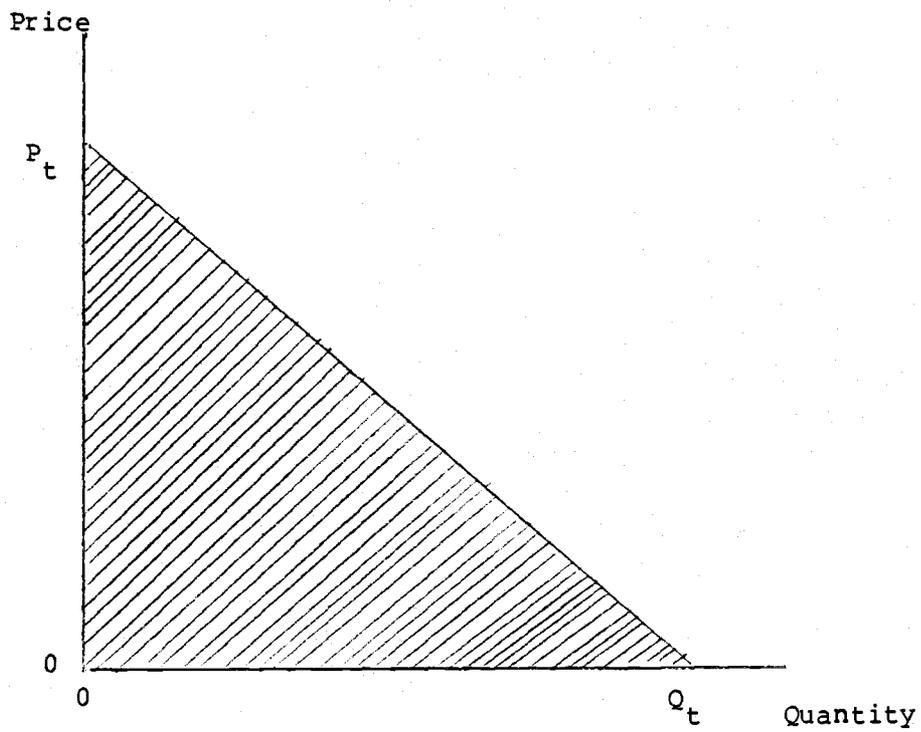


Figure 4. Net revenue to a perfectly discriminating monopolist

Clawson and Knetsch (1966) use the total consumers' surplus area underneath the demand curve to calculate the net economic value of the resource. The consumers' surplus for a zero priced good such as use of a recreation site with no user fee would be the same as the revenue to a perfectly discriminating monopolistic owner of the resource. Again assuming a linear demand curve as in Figure 4, the net economic value of the zero priced good would be the total area underneath the curve, or $\frac{1}{2}(P_t \times Q_t)$.

Brown et al (1964) used both methods to estimate the value of the salmon-steelhead sport fishery and found that the estimate based on total consumers' surplus was slightly over twice that based on net economic value to the non-discriminating monopolist.

Without attempting to give preference to either one of these two methods of estimating benefits, the latter method was chosen. The reason for choosing the method that estimates total consumers' surplus is because the estimate derived from the travel cost method will be compared with the benefit estimate from the contingent valuation method. The CVM estimates total consumers' surplus by asking users of their willingness to pay. The perfectly discriminating monopolist charges the maximum amount (or total WTP) that he can extract from each individual consumer. Therefore, using the method that estimates the total WTP of users by the travel cost model, one can compare the benefits derived from the two different models (CVM and TCM).

Estimation of User Population

Many of the visits made to Cullaby Lake are made by local people who make numerous visits during the year. Therefore, the number of visits made to the lake during the year will be many times the number of people who make these visits. Thus, the user population as well as the total number of visits made to the site must be calculated.

To estimate the number of visits made to the site, mechanical car counters were set up at the entrance to the park. Because it would not be possible to obtain the car counts for a full twelve months, the counts would be taken for June through August to estimate the number of visits made during the summer. In order to estimate the actual number of summer visits made, the average number of people per impulse over the car counter is needed. This is obtained by having someone periodically observe both the number of people crossing the counter and the number of impulses recorded on the counter during a set period of time. The total number of impulses recorded on the car counter for the three months is then multiplied by the estimated average number of people per impulse to derive the total number of visits made during the summer of 1979.

The number of summer visits will be divided by the average user's mean visits per summer to find the number of users of Cullaby Lake County Park. This number of users will be multiplied by the average user's mean visits per year to calculate the total number of visits made in 1979.

Since most of the questionnaires were completed on sunny weekends, the questionnaire data may over-represent specific types of users (such as picnickers and water-skiers) and under-represent other users (such as fishermen). Also a questionnaire completed by a family may represent

four or five people while one completed by an individual represents only one person. If responses from these two types of respondents were used as is, single respondents would be over-represented and family groups under-represented. It was therefore decided to weight the questionnaire data according to activity and group type. Counts were taken of users in various activities at all times of day, seven days a week, to estimate the actual participation rates for each of the three major activities. From questionnaire data, the numbers of family members and individuals were used to weight their respective responses. The equation used to weight the average user's mean number of trips per summer (and trips per year) is presented.

$$\text{Weighted average trips/summer} = \sum (\text{trips}_{ij} \times P_{ij} \times P_j) \quad (10)$$

where:

i = F if family interview, I if individual interview

j = activity (F if fishing, B if boating or skiing, O if pickkicking, swimming, or other activity)

trips_{ij} = average number of trips per summer made by families or individuals in activity j (from questionnaire data)

P_{ij} = participation rate for individuals or families in each activity j (from questionnaire data)
will be P_{Ij} or P_{Fj}

$P_{Ij} + P_{Fj} = 1.0$ for each activity j

$P_{Ij} = \frac{\text{number of individuals with activity } j}{\text{total number of users with activity } j}$

$P_{Fj} = \frac{\text{number of families with activity } j \times \text{average number of users per family with activity } j}{\text{total number of users with activity } j}$

P_j = participation rate for each activity (from periodic counts of users in various activities.

CHAPTER IV

STATISTICAL RESULTS

At Cullaby Lake County Park there were 209 questionnaires completed, five of which were rejected, leaving 204 usable questionnaires. All of those rejected were because the respondents misunderstood the willingness to pay question, giving a zero value because they objected to using passes to pay for recreational facilities.

Estimation of User Population

The car counter at Cullaby Lake County Park stretched across both lanes of traffic, thus counting cars as they entered and as they left the park. The total number of impulses over the car counter for the three summer months was 53,141. If a car passed over the counter slowly, one impulse would be recorded for each axle. If a car was going a faster speed, it sometimes recorded only one impulse. Thus it would be possible for all cars entering the park to also leave and still have an odd number of impulses recorded on the counter. The average number of people per impulse was estimated to be .639. Thus, the total number of visits made to Cullaby Lake County Park during the summer of 1979 was 33,957 (or $53,141 \times .639$).

Through the activity counts, it was found that the large picnic groups made up 30.18% of the total summer visits. It was assumed that large picnic groups use the park only during the summer months. The number of large picnic users was 10,248 ($33,957 \text{ summer visits} \times .3018$).

This means that 23,709 visits ($33,957 \times .6982$) were made during the summer by users who visited the park numerous times to participate in activities other than large group picnics (fishing, boating, skiing, swimming, picnicking, and other activities). From equation (10) on page 36, the average user's mean number of trips per summer was estimated to be 13.2, and the average user's mean number of trips per year was 16.2. The number of summer visits made to Cullaby Lake County Park by the people who participated in activities such as picnicking, water-skiing, fishing, etc., can be divided by the weighted average number of trips per summer made by those same users to yield 1,793 as the number of users ($23,709 \div 13.22$).

For the purposes of benefit estimation, the contingent valuation model will use the figures on number of trips made per user, the number of users, the numbers of users in the various activities, as well as the total number of visits made to Cullaby Lake County Park in 1979. However, the travel cost model will make use only of the figure representing the total number of visits made, which will be estimated in the next section.

Contingent Valuation Model

Given the number of users, activity participation rates, and numbers of trips per year, the willingness to pay can be calculated. It is first calculated for the sample, then expanded to the user population.

The large group picnic sample yielded 19 completed questionnaires representing 1,042 users. From periodic daily counts, the estimated

number of large group picnic users was 10,248, giving an expansion factor of 9.835 ($10,248 \div 1,042$) for that group. The sum of the willingness to pay of the sample was \$455. Thus the total willingness to pay for the use of Cullaby Lake County Park by large group picnickers was \$4,474.92 ($\455×9.835). The average willingness to pay per user was \$0.44 per picnic.

The sample of users participating in the fishing, skiing, and swimming activities yielded 204 completed questionnaires, representing 539 users. The expansion factor for this group is 3.33 ($1793 \div 539$). The sample willingness to pay (weighted for activity participation rates by equation (1), page 26) was found to be \$4,850.45. Thus the total willingness to pay for this group is \$16,152 ($\$4,850.45 \times 3.33$). The average willingness to pay per user was \$9.00 per year and \$0.56 per visit.

Total visits and total willingness to pay can now be calculated by summation of the values for the two groups. Total visits to the park in 1979 is the sum of the visits made by large group picnickers and by users who fish, ski, swim, etc., or 39,295 ($10,248 + [1,793 \text{ users} \times 16.2 \text{ visits per year}]$). The total willingness to pay of all users of Cullaby Lake County Park is \$20,626.92 ($\$4,474.92 + \$16,152$).

The total willingness to pay value can be broken down into the information in Table III on the next page. The combined average willingness to pay for all activities and family status was \$0.52 per visit.

As was mentioned in Chapter III, an attempt was made to determine whether using a longer more complicated form of the willingness to pay question showed any advantage or disadvantage over using a form that was shorter and straight to the point. A correlation coefficient between the

TABLE III. WILLINGNESS TO PAY BY ACTIVITY AND FAMILY STATUS

	Average Family WTP			Average Individual WTP		
	Fish	Ski/Boat	Other	Fish	Ski/Boat	Other
Per Group Per Year	\$19.17	\$33.58	\$22.45	\$16.25	\$27.82	\$20.67
Per Person Per Visit	\$ 0.31	\$ 0.26	\$ 0.18	\$ 0.77	\$ 1.93	\$ 6.21

willingness to pay response and the form of the question used was calculated to test for a difference between mean responses. The coefficient was .04. A correlation coefficient of 1.0 would show perfect correlation. Because the correlation coefficient of .04 is so low, the form of the question used was not perceived to bias willingness to pay responses.

Travel Cost Model

Survey data on the city in which respondents lived was used to divide users into one of the five distance zones. These zones are outlined on the map in Appendix B. Using information on income and family status, users were further divided into the 18 zones used for the model. A listing of the distances, income levels, and family status of these 18 zones can also be found in Appendix B.

Choosing a Model

Coefficients for the linear demand equation on page 28 were estimated using ordinary least squares regression. However, coefficient estimates for all of the independent variables were found to be not significantly different from zero. In an attempt to find a better model, the log-log, linear-log, and log-linear forms of the equation (on page 32) were used. The linear-log and log-log forms presented in Chapter III were tried with all three independent variables in log form and then again with various combinations of the independent variables in logs and real numbers. This was done because it was not known if the expected curvilinear relationship (indicating decreasing marginal utility) between price and quantity would also exist between quantity and income or distance. For both

models, the best results (based on t-tests, F-tests, and correctness of signs) were obtained with the price variable in log form and the income and distance variables in real numbers. Therefore, in Table IV for the linear-log and log-log equations, TC would be the log of travel costs and INC and DIST are in terms of real numbers.

The linear-log model had a significant coefficient estimate for the price variable but not for income or distance. For both the log-linear and log-log forms all of the independent variables had coefficient estimates that were significantly different from zero. In all four equations the travel cost and distance coefficients were negatively signed and the income variable was positively signed as it was predicted that they should be. Defining variables the same as on page 29 of the previous chapter, results of the four forms of the demand equation are shown in Table IV on the next page.

In choosing which model to use to estimate benefits, the R^2 values cannot be compared because for the log-linear and log-log models, the R^2 values given by the computer printout are in terms of logarithms. To compare the R^2 values from the four models, one would have to transform the predicted values of the dependent variable back into real numbers, recompute the error sum of squares, and then recompute R^2 .

Comparing the t values and significance levels of the coefficients of all four models, it can be seen that the log-linear and log-log models are superior to the other two models. Both models have significant coefficient estimates and are correctly signed for the price and income variables which economic theory indicates should be included in a demand model. The same is true for the distance variable which represents the

TABLE IV. RESULTS OF FOUR FORMS OF THE REGRESSION MODEL

Form of Equation	Constant	TC	INC	DIST	R ²	F
Linear	159.125 ^a (819.52) ^b t = .194 ^c $\alpha > .10$ ^d	-15.69 (16.22) t = -.967 $\alpha > .10$	190.43 (166.55) t = 1.14 $\alpha > .10$	-2.95 (4.52) t = -.652 $\alpha > .10$	.227	1.37 $\alpha = .293$
Linear-Log	709.63 (781.99) t = .907 $\alpha > .10$	-1127.6 (527.32) t = -2.14 $.05 > \alpha > .025$	159.12 (147.72) t = 1.08 $\alpha > .10$	-1.28 (4.64) t = .276 $\alpha > .10$	.378	2.84 $\alpha = .076$
Log-Linear	1.36 (.54) t = 2.5 $.05 > \alpha > .025$	-.0375 ^e (.0107) t = -3.5 $.025 > \alpha > .01$	.233 (.11) t = 2.12 $.10 > \alpha > .05$	-.0089 (.003) t = -2.99 $.025 > \alpha > .01$	.765	15.23 $\alpha = .000$
Log-Log	2.1707 (.4075) t = 5.327 $.005 > \alpha > .0005$	-1.70 ^e (.275) t = -6.2 $.005 > \alpha > .0005$	.1645 (.077) t = 2.14 $.05 > \alpha > .025$	-.0042 (.0024) t = -1.75 $.10 > \alpha > .05$	.883	35.11 $\alpha = .000$

a/ coefficient

b/ standard error

c/ t value

d/ level of significance for one-tailed test

e/ the TC variable is the log of TC in the Log-Linear and Log-Log models

cost of travel time. The coefficient estimates are significant at a high enough level that either model could be chosen. Because the t values, F values, and significance levels are slightly higher for the log-log model, that model was chosen to estimate benefits.

Correlation coefficients between the independent variables were checked for the possibility of a problem with multicollinearity. Between INC and LNTC $\rho = -.16$, and between DIST and INC $\rho = -.226$, both of which are very low, so multicollinearity does not yet appear to be a problem. However, between LNTC and DIST $\rho = .63$ which indicates multicollinearity may exist. To further examine this, we can look at the equation without DIST yet added in. The t value for LNTC is -8.71 which is significant at $\alpha = .0005$. Once DIST is added, the t value for LNTC drops (in absolute terms) to -6.2 and the t value for DIST is -1.75 which are significant at $.005 > \alpha > .0005$ and $.10 > \alpha > .05$, respectively. These factors indicate that some multicollinearity may exist, but this multicollinearity is not perceived to be a problem because the coefficients for both LNTC and DIST are highly significant.

To check for heteroskedasticity, a visual examination of the residuals against the independent variables was done. These plots showed no pattern or relationship between the independent variables and the residuals. Thus, heteroskedasticity is not perceived to be a problem. A copy of these residual plots can be found in Appendix C.

All of the independent variables were signed as predicted according to demand theory. The effects on the dependent variable (quantity of visits made) from changes in the independent variables can be examined by looking at the elasticities of each of the independent variables.

Elasticity (the percent change in the dependent variable resulting from a one percent change in an independent variable) is a measure that is unit free. For the log-log relationship between price and quantity, the effect on quantity of any given change in price varies with the magnitude of price. The point elasticities, computed by using mean values for X and Y, are in Table V.

TABLE V. ELASTICITIES OF THE INDEPENDENT VARIABLES

Variable	Elasticity
LNTC	-1.70
INC	.658
DIST	- .281

What these figures indicate is that at the mean values for X and Y:

(1) For a one percent increase in price, there will be a 1.70 percent decrease in quantity of visits taken. An increase in price will thus cause a decrease in total benefits. (2) For a one percent increase in average income (in terms of income strata rather than income in dollars), there will be a .658 percent increase in quantity demanded. (note: Income elasticities are relevant only if the income strata are of equal size, as they are in this case.) (3) For a one percent increase in one-way distance to the site, there will be a .281 percent decrease in quantity of visits taken. From these elasticities and the magnitudes of the coefficients of the demand equation, it is seen that in percentage terms, price has more of an effect on the quantity of visits that will be taken than does income or distance.

It should also be mentioned that there is a difference in the assumption about the error term in a log-log model. While a linear model assumes the error term has an expected value of zero, for a log-log model the log of the error term has an expected value of zero. Also, the elasticities of a log-log relationship are the coefficients.

Estimation of Benefits

To estimate benefits, the consumers' surplus area underneath the estimated demand function had to be estimated. To do this, income and distance were held constant at their mean values and price was allowed to vary. Because the demand function is in log-log form an integral reflecting this had to be used. The form of the demand equation (holding INC and DIST constant at their mean values, thus including them with B_0 as part of the constant term) is $\log VPT = B_0 - B_1 \text{LNTC}$. Because $\log Y = \log B_0 + B_1 \log X_1 + B_2 \log X_2$ can be transformed to the form $Y = B_0 X_1^{B_1} X_2^{B_2}$, the demand function estimated here can be changed to $\log VPT = \log C - B_1 \log TC$ (where $C = \text{antilog } B_0 + B_2 \overline{\text{DIST}} + B_3 \overline{\text{INC}}$) which can be transformed to $VPT = C(TC^{-B_1})$. The integral of VPT (the area under the function representing VPT) is $\int_{TC_i}^{TC_m} C(TC^{-B_1}) du$, which equals:

$$C \left[\frac{1}{1 - B_1} TC^{1-B_1} \right] \Bigg|_{TC_i}^{TC_m} \quad (11)$$

Where TC_m is the maximum TC value which would drive VPT to zero for all zones.

Plugging the TC values for each of the 18 zones in for TC_i , the value of the integral is estimated from TC_m to TC_i for each zone. These figures are multiplied by the zone population per thousand to arrive at a consumers' surplus value for each zone. The consumers' surplus values for each zone are then summed to yield \$145,532 of benefits for Cullaby Lake County Park in 1979 by the travel cost method. This is equal to \$3.70 per visit.

CHAPTER V

COMPARISON OF THE TWO MODELS

Divergence Between Empirical Estimates

Figures from the previous chapter show that the 1979 estimate of visitor days to Cullaby Lake County Park was 39,295. The CVM yielded \$20,627 in benefits and the TCM yielded \$145,532 in benefits. These annual benefits can be divided by the number of 1979 user days to find \$0.52 per day by the CVM and \$3.70 per day by the TCM. A few points must be made in an attempt to partially explain the wide divergence in benefit estimates from the two methods.

First, it was mentioned that Cullaby Lake is a natural lake and that the project stabilized the water level and added recreational facilities to those already present. The CVM is flexible enough to allow wording the WTP question to estimate a value for these improvements only. The TCM does not have this flexibility and can only estimate a total value for the lake, the activity, and the project improvements together. Therefore, this method gives a gross over-estimate of benefits to the project improvements.

However, it should be noted here that the study for which the Cullaby Lake County Park benefit estimate was necessary also entailed estimating benefits for two other small reservoirs constructed by P.L. 566 projects. In these other two cases, the P.L. 566 projects constructed the reservoirs and recreation facilities. Therefore, benefit estimates were required

for the reservoirs and facilities. All three sites are similar in their facilities and the activities possible. In all cases the CVM was used to estimate benefits. The TCM could not be used for these other two projects because there was not a sufficient variation in distance traveled to draw distance zones. The values per day derived by the CVM for those two sites were \$0.26 and \$0.77 (Kraynick, et al., 1980).

It seems strange that a site value for both the reservoir and recreation facilities of \$0.26 is half the value for facilities only at a similar site of \$0.52. This can be explained in large part by crowded conditions at the site with a \$0.26 value per day. The crowding is bad enough on summer weekends to the point of being unsafe a requiring a deputy sheriff patrol. Many respondents stated that they would pay three or four times as much for an annual pass if it were not as crowded.

These two figures of \$0.26 and \$0.77 are also considerably less than the per day value of \$3.70 calculated for Cullaby Lake and facilities. Some of this may be explained by the availability of substitutes. Near Cullaby Lake and near the site with a \$0.26 value per day, there are a number of substitute sites available within a 10 to 15 mile radius for picnicking, swimming, sunbathing and fishing. The distance to the nearest site for waterskiing is much greater, but picnicking, swimming and sunbathing are the most common activities. When answering the willingness to pay question for the CVM, respondents stated they would not pay any more because they could go elsewhere for free. The CVM thus allows consideration of substitute sites. When using the TCM it is possible to explicitly include substitute sites in the model, but this was not done

here. However, some argue that the value of substitutes is implicitly included in the TCM because users are able to consider other sites when they choose which site to visit. At this point, there has not been enough work done on this topic to be able to conclusively decide whether or not the price and availability of substitutes is implicitly considered in the model, or whether it must be added separately.

Another reason that the TCM may overestimate value is if the visit to Cullaby Lake County Park was only one destination on a trip with many destinations. It is possible to account for this in the TCM, but was not possible in this case because of a lack of data. The CVM automatically allows users to consider the relative value of a particular site which is one of many destinations on a trip.

Looking intuitively at these differences in per day values, we see that using the CVM value, a family of four would have to pay \$2.08 for a Sunday afternoon picnic. Using the TCM value, this same picnic would cost \$14.80. Considering that the majority of usage at Cullaby Lake is picnicking, swimming, sunbathing, and socializing, and that there are a fair number of other picnic sites in the area, the CVM per day value seems to be a more reasonable reflection of peoples' willingness to pay for use of Cullaby Lake County Park rather than for a substitute site.

How well the CVM values per day describe actual values held by users may depend upon the specific activity in which users participate. There are many substitutes available and little capital expenditure incurred for swimming, picnicking, and sunbathing. For these activities, the low CVM values estimated in this study may be fairly accurate. However, for smooth water

waterskiing and boating there are no substitutes in the area and the capital expenditure necessary is much larger. The CVM value per day may be higher for users with these activities than the values obtained here if users were faced with having to make an actual decision. In the case of an actual decision more time and thought would be put into a decision concerning the more capital intensive activity with few substitutes. If users were allowed this time to consider the take it or leave it atmosphere of the market, they may pay a higher price to waterski now that they have made the expenditure on a boat.

Comments on the Contingent Valuation Method

The main drawback of the CVM is in its hypothetical nature. The responses obtained are not firm, enforceable offers, but are behavioral intentions. Biased responses may be obtained. These biases (Randall and Brookshire, 1978) are: (1) hypothetical bias, which results from a failure to invest as much effort in making a contingent decision as would be for an actual decision; (2) strategic bias, an attempt to influence the outcome of the survey by overstating one's own preferences or distastes, hoping to alter the mean outcome; (3) starting point bias; and (4) vehicle bias which cause the mean WTP values to differ significantly across various starting points or payment vehicles, respectively. In reference to the first two biases, hypothetical bias and strategic bias, psychologists (Ajzen and Fishbein, 1977) find that for most people, truth-telling is preferred to prevarications, unless truth-telling entails significantly greater costs. "The information and computational require-

ments for effective strategies are so demanding that they provide a disincentive for strategic behavior in contingent markets." The latter two biases, starting point bias and vehicle bias can be eliminated by pre-testing of the WTP question and checking for differences between the means across various starting points and payment vehicles. This test for a difference between the means for different starting points was done for this study and found no bias. However, only one payment vehicle was tested. It was accepted because of the low percentage of protest responses obtained during the pretest (5.9 percent). An even lower protest response rate resulted from the sample survey (2.0 percent).

The contingent Valuation Method may be considered superior to other methods in a number of ways. (1) It allows trade in public goods. Consumers may be allowed to examine many options in terms of levels and combinations of public goods. (2) Respondents are able to consider the values they place on various activities as well as their individual tastes and preferences for the site. (3) They are able to consider all substitute goods available to them when answering the WTP question. (4) This method is appropriate for evaluating projects that may result in a change in quantity or quality of recreation at a particular site. (5) Respondents are able to consider their time costs incurred in travel to and from the site. (6) Non-users as well as users of an actual or potential site can be questioned, allowing estimation of option or preservation values.

For all of these advantages of using the CVM, it must be kept in mind that responses are not firm, enforceable offers.

Comments on the Travel Cost Method

To discover the weaknesses of the zone average TCM one can look at the implicit assumptions. First, subpopulations within each distance zone are assumed to have identical tastes, preferences, incomes, and other socioeconomic characteristics. Second, prices and availability of related goods (substitute activities and complementary goods) are assumed equal, on a population average, across various distance zones. Third, the site being evaluated is assumed to be the sole purpose of the users' observed trips. This would tend to over-estimate value if the site is only one stop on a trip with another destination. Fourth, the time and displeasure of travel are not considered, resulting in an under-estimate of site value. Fifth, the TCM may also under-estimate the value of the site because it does not consider any option or preservation value to non-users. Finally, this method is not flexible enough to estimate the benefit of a change in quality or quantity of recreation at an existing site.

The individual observations model used by Brown et al (1973) attempts to incorporate such things as socioeconomic data, time costs of travel, activity values and to improve the statistical reliability of the model. Attempts have also been made to incorporate these same variables as well as substitutes available into the zone averages model and individual observations models (Ward, 1980). These attempts have met with varied success, and there is no well defined travel cost model to follow, either to estimate the demand function or the resultant benefit.

In this particular usage of the TCM, income and distance (represent-

ing the time cost of travel) are included in the model, but those variables are still considered to be constant within each zone. It is not clear whether or not the prices and availability of substitutes are implicitly included in the TCM. In this case, because of lack of data, they are assumed constant across all zones as well as within each zone. These problems in usage of the TCM are somewhat peculiar to this application. Many of these problems could be alleviated by the gathering of relevant data. The TCM may be better applied to a site such as the Grand Canyon where users travel from all over and there are no substitutes. A site such as Cullaby Lake County Park which gets predominantly local usage and has many substitutes may not be a good application of the travel cost method.

The study by Bishop and Heberlein (1979) which was briefly mentioned in Chapter II compared results of the TCM and direct questioning of willingness to pay. Their results showed hypothetical willingness to pay values that were higher than their travel cost estimates. These results are the opposite of what was found in this study. The divergence in results may be explained by the fact that goose hunting when only a limited number of permits are issued is a more capital intensive activity and a much more unique activity than picnicking at a local reservoir.

The Two Methods in Use

It may be useful to compare these two methods from the standpoint of a public agency that must estimate recreation benefits for existing or proposed projects. For both of these methods, some means of determin-

ing the number of user days taken at an existing site, or potential user days to be taken at a proposed site, must be made. The method of estimating total visits outlined in this thesis gives one method that can be used for a locally used recreation site, where most of the same users make repeated visits. For a site where division into activity participation rates are not necessary, or weighting according to family make-up is not needed, the estimate of the number of user days may be made by keeping track of the number of impulses on a car counter and obtaining an estimate of the average number of people per impulse on the car counter. Once the estimation of user days has been made, benefits can be estimated by one of the two methods.

For the travel cost method, data are usually gathered at the site for which benefits are being estimated. If a benefit estimate is needed for a site being planned, data must be gathered at a similar area. Difficulty is usually encountered when trying to find a similar area to use. The greater the dissimilarities between sites, the less reliable will be the results. Data may be gathered by personal interview or by mail questionnaire. Personal interviews are expensive, but response rates are many times lower with mail surveys. Once the data have been gathered, parameters of a regression equation must be estimated and statistical interpretation of the results must be made. Then the consumers' surplus area underneath the demand curve must be estimated. These steps sometimes require a great deal of work (and more room for error) and someone who is knowledgeable on how it is done.

Contingent valuation requires personal interviews which are expensive to obtain. Great care must be given to the writing of the willingness to

pay question, and it must be pretested to be sure it is non-threatening, unbiased, and presents a credible situation. However, once the data are gathered, it is relatively simple to sum individual values for the sample willingness to pay, then expand it to the population. The CVM is much more flexible and allows estimation of benefits of an existing or proposed project, as well as marginal values for the composition or size of various packages of public goods.

As for the reliability of results, some side with the travel cost method, while others are in favor of contingent valuation. This study demonstrated the widely divergent values that can be obtained for the same site by using the two models. One could argue on the one hand that the contingent valuation model is based on words, while the travel cost method is based on the actions of recreationists. Recreationists may have incentive to underestimate their true valuation. Thus the travel cost method would be more reliable. On the other hand, one could argue that the travel cost method picks up values that belong to other sites visited along the way, or the value to a family of the Sunday afternoon picnic, or the value of simply getting out and doing something in addition to the value of the site, while the contingent valuation method picks up site value only. In this respect, the travel cost method would be over-estimating site value by including the activity value in the benefit estimate. When choosing which of these two methods to use to estimate benefits of a site, some of the factors to be considered are:

- (1) The ability to find a "similar site" for the estimation of a proposed project's benefits by the TCM,
- (2) the ability of the contingent valuation

question to simulate a market transaction and the availability of a credible payment vehicle, and (3) the flexibility necessary for the benefit estimate. In other words, will the TCM be able to capture the benefit estimate for a change in quality or quantity of the public good?

CHAPTER VI

SUMMARY AND CONCLUSIONS

Results

The objective of this thesis was to use and compare two methods of estimating the benefits of a particular recreation site. The two models used were the contingent valuation (direct questioning of willingness to pay) and the travel cost methods. The results of the two models are presented here.

The contingent valuation method questions a sample of users of the recreation site about their willingness to pay for one year's use of the site. The sample's willingness to pay is then expanded to the user population. Total visits made to the park in 1979 were 39,295 and their willingness to pay for use of the park was \$20,626.92 or \$0.52 per visit.

The travel cost method uses information on users' travel expenditures, income and travel time to estimate a demand function for the quantity of visits made. Users are divided into 18 distance zones and all variables are zone averages. Travel expenditures are used as a proxy price variable and visits per thousand population per zone is the quantity variable. The response function chosen is shown below.

$$\text{LNVP} = 2.1707 - 1.70 \text{ LNTC} + .1645 \text{ INC} - .0042 \text{ DIST} \quad (12)$$

(.4075) (.275) (.077) (.0024)

where:

LNVPT = log of visits per thousand population

LNTC = log of travel expenditures in dollars

INC = income (divided into seven income strata)

DIST = one-way distance traveled in miles.

The figures in parentheses below the coefficients are their standard errors. Integration of the area underneath the demand curve (derived from this response function) gives the consumers' surplus, or benefits attributable to the recreation site of \$145,532 or \$3.70 per visit.

Part of the reason for the divergence between the values estimated by the two methods lies in the fact that the two methods were not estimating a value for the same thing. The site which was used for this study is a natural lake with two parks on it. One park is small and has a limited amount of facilities. The park for which benefits were to be estimated is on another side of the lake and is much larger with better facilities. The benefit estimate desired is for the larger park itself, not for the lake and parks as a whole. The contingent valuation method enables estimation of the benefits of the park facility by itself. The travel cost benefit estimate includes a value for recreation at the lake, the lake itself, and the park.

Conclusions

Values derived by the two methods were vastly different: \$0.52 per visit by the contingent valuation method and \$3.70 per visit by the tra-

vel cost method. Part of the reason for this divergence is because the travel cost method was not able to place a value on just the park itself. Therefore it can be said that it is not as flexible as the contingent valuation method. However, the contingent valuation method suffers from its hypothetical nature. With the contingent valuation model, users are asked how much they would pay for use of the site. Since this presents a hypothetical market to them, they may not put as much thought into the decision as they would in an actual market, or they may purposely over- or under-state their true valuation if they felt their response would influence policy. Because neither of these methods have been perfected no one can really say one method is better than another. However, for specific types of problems, one method may be preferred over another. Because an estimate of the park facilities rather than the park and lake was desired, the contingent valuation method may be more reliable in this case.

Implications for Future Research

Both the CVM and TCM have been in use for a number of years and have gone through many changes. The travel cost model has probably been used more frequently than the contingent valuation method. There are still many problems associated with the two methods. Future use of the travel cost method should center on the inclusion of socioeconomic variables and variables which account for the existence of substitutes because these factors are important determinants of demand for any good. Future

use of the contingent valuation model should focus on survey design in an attempt to discourage biased responses.

BIBLIOGRAPHY

- Ajzen, I. and M. Fishbein. "Attitude-Behavior Relations: A Theoretical Perspective and Review of Empirical Research," Psychological Bulletin, 84:888-918, 1977.
- Bishop, Richard C. and Thomas A. Heberlein. "Measuring Values of Extra-Market Goods: Are Indirect Measures Biased?" Invited paper presented at the Annual Meetings of the AAEA, University of Wisconsin, 1979.
- Blank, F., et al. "Valuation Of Aesthetic Preferences: A Case Study of the Economic Value of Visibility," Research Report to the Electric Power Research Institute, Resource and Environmental Economics Laboratory, University of Wyoming, 1977.
- Brookshire, D. S., B. S. Ives, and W. D. Schulze. "The Valuation of Aesthetic Preferences," Journal of Environmental Economics and Management, 3:325-346, 1976.
- Brookshire, D. S., A. Randall, et al. "Economic Valuation of Wildlife," Final Report for U. S. Fish and Wildlife Service, Phase I, Resource and Environmental Economics Laboratory, University of Wyoming, 1977.
- Brown, William, Ajmer Singh, and Emery Castle. "An Economic Evaluation of the Oregon Salmon and Steelhead Sport Fishery," OSU Exp. Sta. Techn. Bull. 78, Oregon State University, Corvallis, OR, 1964.
- Brown, William, Farid Nawas, and Joe Stevens. "The Oregon Big Game Resource: An Economic Evaluation," OSU Ag. Exp. Sta. Oregon State University, Corvallis, OR, 1973.
- Cesario, Frank J. and Jack L. Knetsch. "Time Bias in Recreation Benefit Estimates," Water Resources Research 6, 6:700-704, 1970.
- Clawson, Marion. "Methods of Measuring the Demand for and Value of Outdoor Recreation," Reprint No. 10, Resources for the Future, Washington D.C., 1959.
- Clawson, Marion and Jack L. Knetsch. Economics of Outdoor Recreation, Resources for the Future, Washington D.C., 1966.
- Gum, Russel L. and William E. Martin. "Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation," AJAE, 11:558-566, 1975.

- Hammack, J. and G.M. Brown. Waterfowl and Wetlands: Toward Bioeconomic Analysis, Johns Hopkins University Press, Baltimore MD, 1974.
- Hotelling, Harold. Letter quoted in: National Park Service, U.S. Department of Interior. "The Economics of Public Recreation: An Economic Study of the Monetary Evaluation of Recreation in the National Parks," Washington, D.C., 1949.
- Knetsch, Jack L. and Robert K. Davis. "Comparisons of Methods for Recreation Evaluation," Water Research, ed. by Allen V. Kneese and Stephen Smith, Johns Hopkins University Press, Baltimore, MD, 1966, pp, 125 - 142.
- Kraynick, R., N. Smith, H. H. Stoevener, W. Tay, and M. Thompson. "Ex Post Analysis of Three Small Watershed Projects in Oregon," Oregon State Department of Ag. & Resource Econ. Report, Corvallis, OR, 1980.
- Marshall, Alfred. Principles of Economics: An Introductory Volume, 8th ed., Macmillan, London, 1920.
- National Park Service, U.S. Department of the Interior. "The Economics of Public Recreation," Washington D.C., 1950.
- Randall, A., B. Ives, and E. Eastman. "Bidding Games for Valuation of Aesthetic Environmental Improvements;" Journal of Environmental Economics and Management, 1:132-149, 1974 (a).
- Randall, A., B. Ives, and E. Eastman. "Benefits of Abating Aesthetic Environmental Damage from the Four Corners Power Plant, Fruitland, New Mexico," New Mexico S. U. Ag. Exp. Sta. Bull. 618, Las Cruces, NM, May 1974 (b).
- Randall, Alan and David S. Brookshire. "Public Policy, Public Goods, and Contingent Valuation Mechanisms," Staff Paper 68, Dept. of Ag. Economics, U. of Kentucky, Lexington, KY, June 1978.
- Ward, Frank A. "A Review of Problems and Solutions in the Use of the Travel Cost Method for Valuing Recreational Resources," Dept. Staff Report No. 14, Dept. of Ag. Econ. & Ag. Business. NMSU, Las Cruces, NM, 1980.

APPENDICES

A P P E N D I X A

QUESTIONNAIRES

Date of Interview _____

Questionnaire Number C.L.

Time Interview Started _____ a.m./p.m.

CULLABY LAKE RECREATION SURVEY

Department of Agricultural &
Resource Economics
Oregon State University
Corvallis, OR 97331

Summer 1979

Hi! My name is _____. I am working on a recreation survey for Oregon State University. If you don't mind I would like to ask you a few interesting questions. All of them are to gather information on a study we are doing on the benefits and costs of small watershed projects, such as the Cullaby Lake Project which created this lake. The results of our study will be used in the planning for future developments like the Cullaby Lake Project.

We are especially interested in finding out how people like you use this lake and how they feel about it. My questions will only take a few minutes. All information that you give us is strictly confidential and the results are tabulated for the area as a whole, not for any one person.

1 - 1 Yes Is this your first trip to Cullaby Lake Reservoir?
- 2 No (If "yes" skip to question 4)

2 - ____ Years How many years have you been coming to this Reservoir? ✓

3 - ____ Trips About how many trips a year do you make to Cullaby Lake Reservoir? ✓

4 - ____ Persons Including yourself, what is the number of people in your party here?
(If only one person, skip to question 6) ✓

5 - 1 Family Would you describe your group as family or non-family?
- 2 Non-Family ✓

6	Most	Next	Third	Fourth	
	1	1	1	1	- - Fishing (shore)
	2	2	2	2	- - Fishing (boat)
	3	3	3	3	- - Waterskiing
	4	4	4	4	- - Motor boating
	5	5	5	5	- - Picnicking ✓
	6	6	6	6	- - Swimming
	7	7	7	7	- - Camping
	8	8	8	8	- - Canoeing/Rafting
	9	9	9	9	- - Sunbathing
	10	10	10	10	- - Hiking ✓
	11	11	11	11	- - Photography ✓
	12	12	12	12	- - Other ✓
	13	13	13	13	- - No Other

(INTERVIEWER: HAND RESPONDENT CARD A)
Using the numbers on the card, what is your single most important activity while at Cullaby Lake Reservoir? Which is next in importance? Which is third? Fourth?

- 7 - 1 Car ✓
- 2 Pickup ✓
- 3 Motorcycle ✓
- 4 Bicycle ✓
- 5 Boat (on trailer)
- 6 Boat/canoe/raft (on or in car)
- 7 Camper
- 8 Trailer
- 9 Trailer
- 10 Other: _____

(INTERVIEWER: HAND RESPONDENT CARD B)
 From the numbers on the card, which of the following vehicles and recreational equipment do you normally bring on a trip to the Reservoir? If there are any other major items not listed, please give us those too. Anything else?

8 Now, I will read something to you before I ask you the next question. Here is a card so that you may read along.

(INTERVIEWER: HAND RESPONDENT CARD C)

Try to place yourself in the situation I am going to describe. It is purely hypothetical and does not mean that there are plans to charge for the use of Cullaby Lake Park. We are only interested in finding out how people like you value parks of this type. Speaking for (your family, yourself) imagine you are living in an area similar in all respects to the one in which you are living now. This means that the recreation available, the nearness and size of surrounding cities and towns, the climate and landscape, would all be the same. There is even a lake similar to Cullaby Lake. The only access to this lake is a park with a small parking area and sand beach, and a dirt boat ramp. On this lake there is a place that could be cleared for a park with two large parking areas, a paved boat ramp, more sand beaches, picnic tables, shelters, stoves, and flushing restrooms, identical to the current Cullaby Lake Park. In order to build this larger park, a substantial amount of money would be needed which is not available. An annual (family) passes could be sold to help pay the park's annual costs, and only those holding current annual passes would be allowed to use this new park facility for any type of recreation. Let me repeat that there are no plans to charge for the use of Cullaby Lake Park. We merely want to find out how people would value a park facility identical to Cullaby Lake Park.

Now, before I ask you if you would buy such a pass, assume that you would use this hypothetical park the same as you use Cullaby Lake Park now. This means that you would make the same number of visits per year and there would be the same number of other people using the park. If such an annual (family) pass cost \$ _____ would you buy one?

If the pass cost \$ _____, would you buy it then? How about \$ _____?

9a - 1 Yes Do you live near the lake here?
 - 2 No (If no, skip to 9c)

9b - 1 Lake Do you live right on the lake, or the canal?
 - 2 Canal

9c - ____ City Where do you live at this time?
 - ____ State What county is that in?
 - ____ County

10 - ____ Years How long have you lived there?

Starting Price

10	30	50	100	200	500
	28.75	48.75	97.50	193.75	475.00
9.00	27.50	47.50	95.00	187.75	450.00
	26.75	46.25	92.50	181.25	425.00
8	25	45	90	175	400
	23.75	43.75	87.50	168.75	375.00
7.00	22.50	42.50	85.00	168.50	350.00
	21.25	41.25	82.50	156.25	325.00
6	20	40	80	150	300
	18.75	38.75	77.50	143.75	287.50
5.00	17.50	37.50	75.00	137.50	275.00
	16.25	36.25	72.50	131.25	262.50
4	15	35	70	125	225
	13.75	33.75	67.50	118.75	237.50
3.00	12.50	32.50	65.00	112.50	225.00
	11.25	31.25	62.50	106.25	212.50
2	10	30	60	100	200
			57.50		
1.00			55.00		
			52.00		
			50		

0



Why would you not want to buy such a Pass? _____

What is the maximum price at which you would be willing to buy such an annual pass:

\$ _____



(INTERVIEWER: If respondent lives inside Union or Baker Counties skip to question 17)

- 11 - 1 Yes We are also interested in the expenditures made by recreationists who come from outside the local area to use Wolf Creek Reservoir.
 - 2 No Are you staying overnight in the local area? ✓
 (If "no", skip to question 14)

12 - _____ Days How many days and nights do you expect to be in the area on this trip? ✓
 - _____ Nights

13 - \$ _____ What has been the cost, if any, of your lodging per night? ✓

14 - \$ _____ What, if any, is your approximate expenditure for meals eaten in restaurants per day? ✓

15 - \$ _____ What were your expenditures, if any, made in this area for food and drink which you prepared yourself?

16 Did you make any other expenditures in this area while on this trip? What were they? Anything else?
 - \$ _____ Items _____
 \$ _____
 \$ _____
 \$ _____

Finally, I would like to ask you a couple of questions about yourself if you don't mind. Please remember that all information is confidential.

- 17 - 1 grade 0 - 8 (INTERVIEWER: HAND RESPONDENT CARD D)
 - 2 some high school
 - 3 grade 12 Would you please indicate the number on the card corresponding to the highest level of schooling you have completed.
 - 4 some college or additional schooling
 - 5 college degree
 - 6 post graduate degree

18 Was your total income before taxes (for your family) above or below \$15,000 for 1978?

IF BELOW \$15,000

Was your gross income for 1978 above or below \$10,000?
 3. Above \$10,000

IF BELOW \$10,000

Was your gross income for 1978 above or below \$5,000?
 2. Above \$5,000
 1. Below \$5,000

IF ABOVE \$15,000

Was your gross income for 1978 above or below \$25,000?

If Below \$25,000

Was your gross income for 1978 above or below \$20,000?
 5. Above \$20,000
 4. Below \$20,000

If Above \$25,000

Was your gross income for 1978 above or below \$35,000?
 7. Above \$35,000
 6. Below \$35,000

19 Is there anything else you would like to say about Wolf Creek?

Thank you for your time and cooperation. Have a nice day.

Time interview ended _____ a.m./p.m.

General Remarks by Interviewer

Signature of Interviewer

Short form of the Willingness to Pay Question

We're looking for a way in which we can place an economic value on this reservoir. But, there are no plans to charge for the use of Cullaby Lake Park. So, just for the moment, lets say that I am selling annual (individual, family) passes to Cullaby Lake Park. Only those who buy passes would be allowed to use this reservoir. If the pass cost \$ _____ would you buy one?

If the pass cost \$ _____ would you buy it then? How about \$ _____?

7 We're looking for a way in which we can put an economic value on this park. But, there are no plans to charge for the use of Cullaby Lake Park. So, just for the moment, lets say that I am selling group picnic permits for Cullaby Lake Park. Only those who buy permits would be allowed to use this park. If the permit cost \$ _____ would you buy one?

If the permit cost \$ _____ would you buy one then?

8 _____ Persons How many of the people in your group here live outside of Clatsop County?

9 _____ Where do they live at this time?

10 - Yes Is their main reason for coming to Clatsop County to attend this picnic?

- No

A P P E N D I X B

D I S T A N C E Z O N E S

TABLE VI. Travel Cost Zones Defined By Distance,
Income, and Family Status

Zone	Distance	Income	Family Status
1	0 - 10 miles	0 - 3	Family
2	0 - 10	0 - 3	Individual
3	0 - 10	4 - 5	Family
4	0 - 10	4 - 5	Individual
5	0 - 10	6 - 7	Family
6	0 - 10	6 - 7	Individual
7	11 - 50	ALL	Family
8	11 - 50	ALL	Individual
9	51 - 80	ALL	Family
10	51 - 80	ALL	Individual
11	81 - 100	0 - 3	Family
12	81 - 100	0 - 3	Individual
13	81 - 100	4 - 5	Family
14	81 - 100	4 - 5	Individual
15	81 - 100	6 - 7	Family
16	81 - 100	6 - 7	Individual
17	101 +	ALL	Family
18	101 +	ALL	Individual

Income: 0 - 3 = \$ 0 - \$15,000
 4 - 5 = \$15,000 - \$25,000
 6 - 7 = \$25,000 +

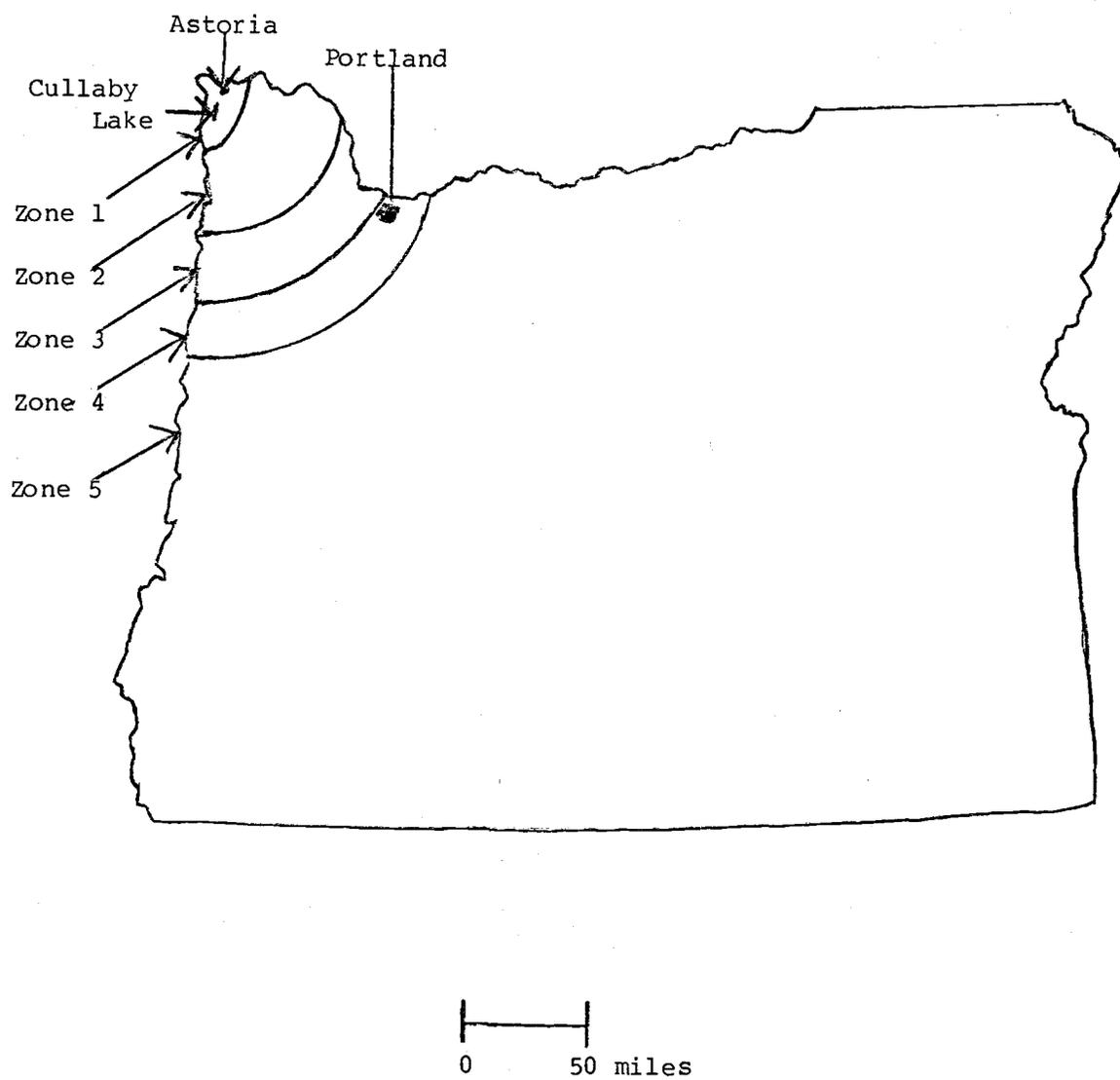


Figure 5. Map of travel cost distance zones - five zones defined

APPENDIX C

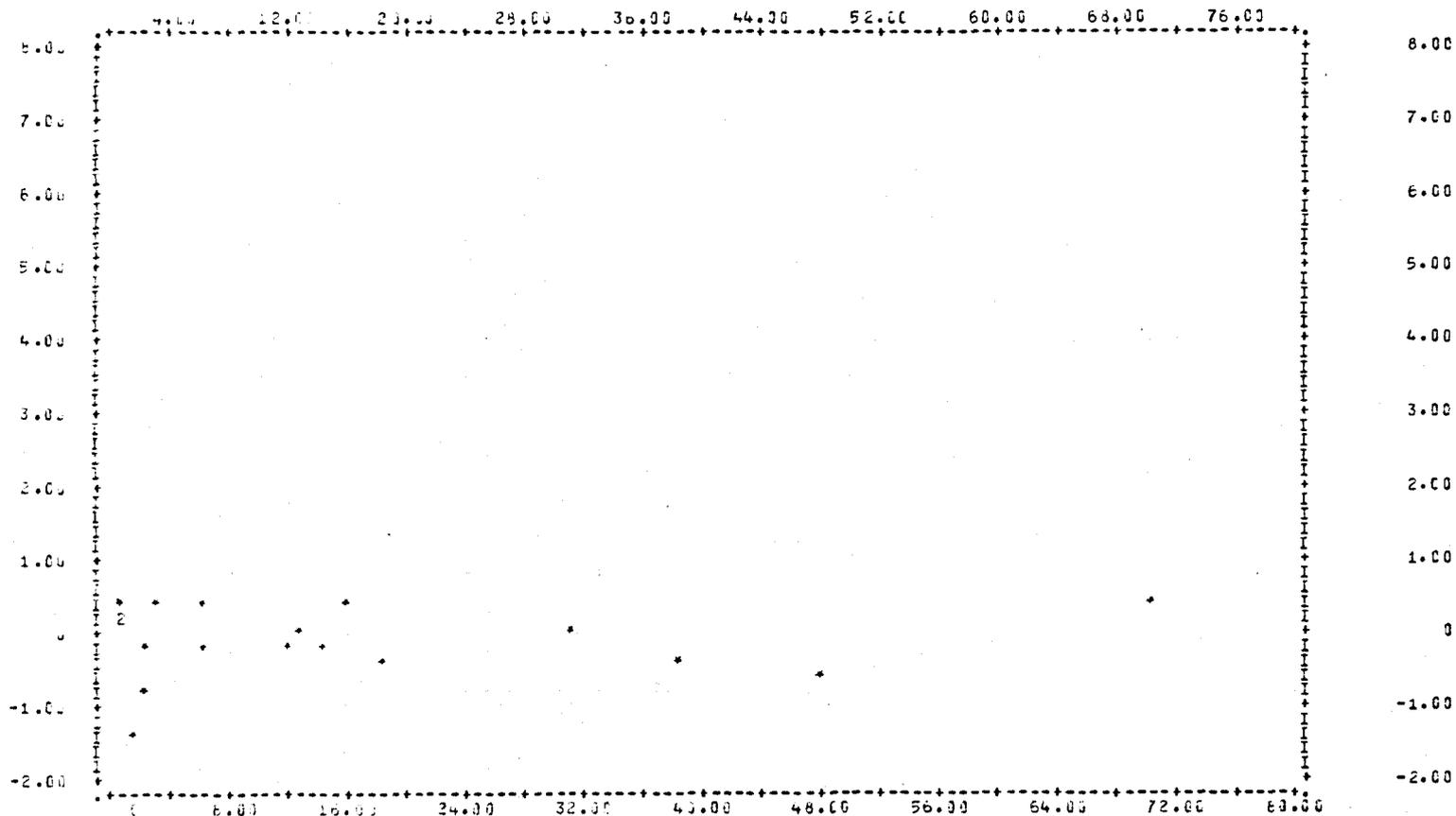
SCATTERGRAMS OF RESIDUALS AGAINST INDEPENDENT VARIABLES

SCATTER

80/05/28. 15.20.35. PAGE 7

FILE NO.NAME (CORRELATION DATE = 80/05/28.)

SCATTERGRAM OF (DOWN) RESID
(ACROSS) TC



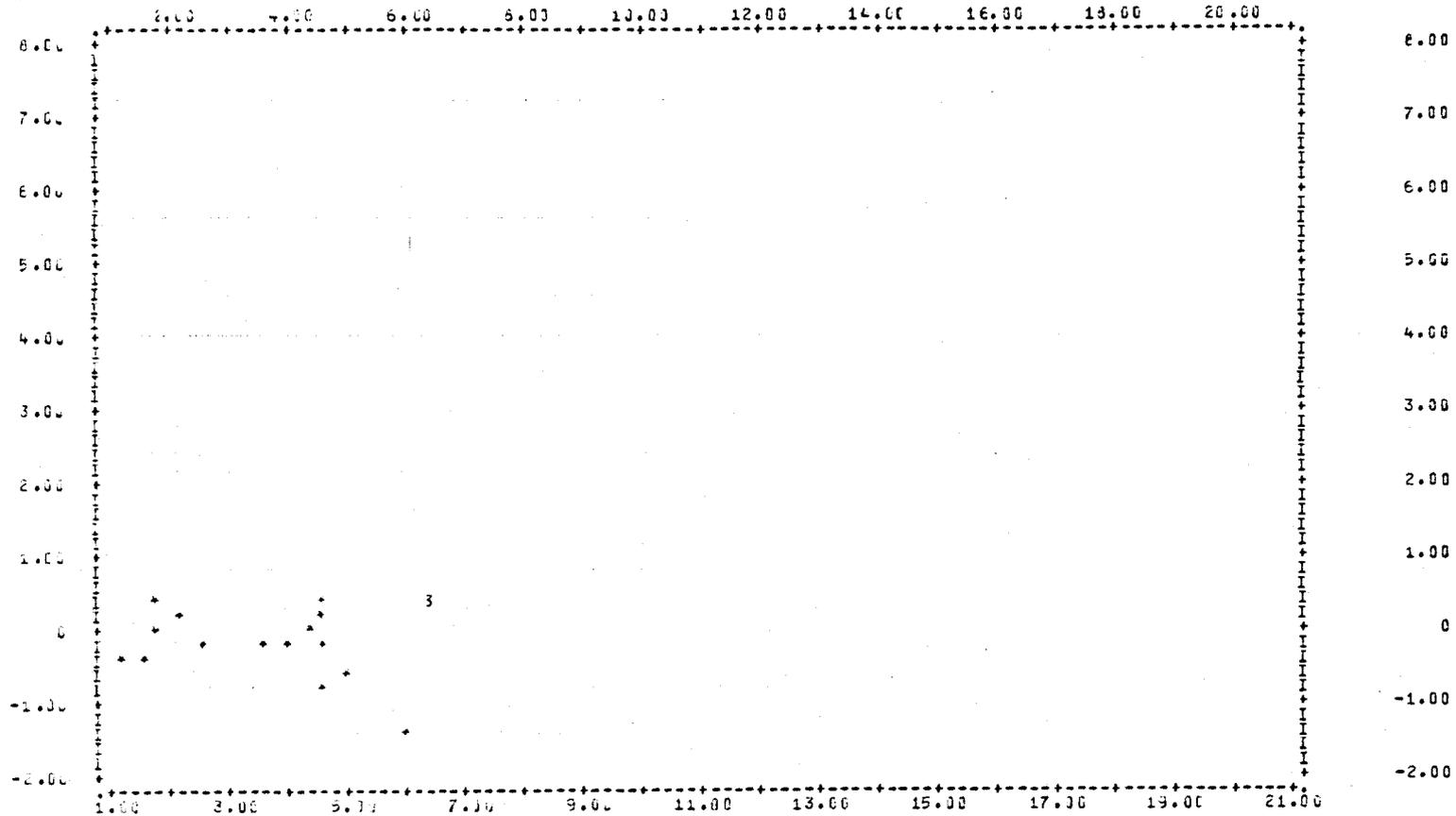
PLOTTED VALUES - 18 EXCLUDED VALUES - 0 MISSING VALUES - 0

SCATTER

80/05/28. 15.20.35. PAGE 4

FILE NO:NAME (CREATION DATE = 80/05/28.)

SCATTER-GRAM OF (DOWN) RESID
(ACROSS) INC



PLOTTED VALUES - 13 EXCLUDED VALUES - 0 MISSING VALUES - 0

SCATTER
 FILE NAME (CREATION DATE = 80/05/28.)
 SCATTERGRAM OF (BOOKS) LIST

