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Utah Boating and Fishing Survey: Applying Contingent Valuation and Travel Cost Methods to Estimate Recreation Values in Northern Utah for the Bear River Water Development Project

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UTAH BOATING AND FISHING SURVEY: APPLYING CONTINGENT VALUATION AND TRAVEL COST METHODS TO ESTIMATE RECREATION VALUES IN NORTHERN UTAH FOR THE BEAR RIVER WATER DEVELOPMENT PROJECT

by

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Utah Boating and Fishing Survey: Applying Contingent Valuation and Travel Cost Methods to Estimate Recreational Values in Northern Utah for the Bear River Water Development Project

by

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The intent of this thesis is to compare contingent valuation methods (CVM) and travel cost methods (TCM) to estimate consumer surplus for boaters and anglers in northern Utah. TCM results are about three times that of CVM. Several limitations are noted, specifically that CVM solicits given willingness to pay (WTP) for specific reservoir sites. TCM analyzes aggregated trips to reservoirs with a wide array of site characteristics.

(88 pages)

CHAPTER 1

INTRODUCTION AND PROBLEM STATEMENT

In 1991, the Utah Division of Water Resources (UDWR) proposed and analyzed a group of water projects on the Bear River in northern Utah using seven different criteria: (1) municipal and industrial water for the Wasatch Front, (2) Box Elder and Cache County municipal and industrial water, (3) hydropower, (4) flood damage reduction, (5) irrigation, (6) bird refuge, and (7) recreation. All of these measurements were constrained by three assumptions: (1) the discount rate used to evaluate future benefits to present costs was 5.64%, (2) the relevant proposed location was Utah, and (3) the planning period for the reservoir was 100 years (Summers).

The recreation section of the analysis is the focus of this thesis. Boating and fishing values were derived from both travel cost methods (TCM) and contingent valuation methods (CVM) in this study. The challenge of valuing nonmarket goods, in this case recreation, has been the subject of much debate. The topic is discussed at some length in the second volume of *Measuring the Benefits of Water Quality Improvements Using Recreation Demand Models* (Bockstael, Hanemann, and Strand). Unlike estimating values in private markets, researchers are far from coming to a consensus on the method(s) and procedure(s) for estimating values of public nonmarket goods that are acceptable. Bockstael, Hanemann, and Strand cited a number of conferences in which participants have agreed not to concur on any given process. The authors argue that perhaps market and nonmarket goods are not comparable.

However, researchers seem to have reached a consensus on the "willingness-to-pay" paradigm. Its evolution was stimulated by scrutinizing the TCM approach, thus revealing two major weaknesses. The first weakness is lack of affiliation between what is measured (e.g., recreation) and market goods. The second lies in the fact that several different values can be derived by the same method. Both of these faults make TCM hard to rely on (Bockstael, Hanemann, and Strand). Only with proper model specification and estimation can assumptions be identified and possible biases be noted.

In order to value a new site, it is necessary to know either the value to anglers and boaters per trip to the site and the number of additional trips from a given origin or to find the total additional value of a new site to a user on an annual basis. By eliciting an annual fee from respondents, this problem can be avoided by using the CVM. (For this reason, the question on the number of net trips was included. Two values are needed for estimation: annual fee, and value per trip based on both miles and trips.)

Although it is easy to see that nonmarket methods may not be entirely accurate, there are few alternatives. The objective of this thesis is not to find new methods of measurements of nonmarket values, but rather to apply the CVM and TCM methods to calculate consumer surplus (equivalent variation) for flat water recreation associated with the proposed reservoirs. The total recreation value for northern Utah regarding the Bear River Water

Development Project is calculated by multiplying the two values by the number of registered boaters in each region.

The recreation values for the Bear River Water Development Project(s) may be added to the aggregate value of the six other uses listed above. If aggregate costs are more than aggregate benefits, there may be little economic incentive to construct these projects, except for redistribution. If however, benefits exceed costs, the project(s) would have a beneficial impact on the populace of Utah.

CHAPTER 2

OBJECTIVES

The objective of this study is to use survey data from boaters and anglers in Utah to estimate water recreational values for the Bear River Water Development Project. This is done by comparing: (1) travel cost techniques and (2) contingent valuation methods. Through the calculation of the consumer surplus (equivalent variation) from linear specifications, a range of values is found, leading to the calculation of total net recreational benefits for the proposed project.

CHAPTER 3

THEORY AND REVIEW OF LITERATURE

Introduction

This study will look at two kinds of nonmarket valuation techniques for valuing recreation activities: travel cost method (TCM) and contingent valuation method (CVM). TCM solicits actual costs or information pertaining to a given activity, including equipment used, time travelled, mileage driven to the activity site, and time taken to do the activity. CVM asks hypothetical questions about specific activities, sites, and conditions. Both techniques are used to try to derive the users' willingness to pay (WTP) and, ultimately, gain insight into the total benefits of an activity or type of recreation.

Travel Cost Method (TCM)

TCM is based on the assumption that

> the per capita use of a recreation site will decrease as out-of-pocket and time costs of traveling to the site increase, other variables being constant. TCM consists of deriving a demand curve by using the variable costs of travel and value of time as proxies for price (U.S. Water Resources Council, p. 6).

Bishop and Herberlein noted that TCM was an "indirect method" and did not deal with goods that could be bought and sold in an open market, but rather expenses in the course of traveling for recreation. Sources of bias for TCM include: tastes and preferences, access to substitute recreational sites, and incomes at varying distances from sites. There was also the problem of

time costs, where Bishop and Herberlein noted that distance and travel time were positively correlated with travel costs. Bishop and Herberlein found several alternate values for TCM by selecting zero, a quarter, and a half of wage rates as values for travel time, even though it has been argued that wage fractions are not applicable due to the fact that participants would be recreating even if they were not earning income (Bishop and Herberlein). It has been suggested that there may even be complementarism between travel and recreation. In other words, the more time spent travelling increases the choices of sites, thus, increasing the utility derived from recreating (Johnson).

Bockstael, Hanemann, and Strand pointed out that researchers often handle travel time on an ad hoc basis and that there is a lack of dominance among techniques for estimating time costs. Delineating between travel and on-site recreational time may be a difficult task. When travel cost and travel time are included in the same demand function, strong multicollinearity may occur. According to Kmenta, multicollinearity is a matter of degree. It is strong multicollinearity that concerns Bishop, Hanemann, and Strand in TCM.

Bishop and Herberlein noted several other limitations of the TCM, including multiple-site visits, multiple-purpose visits (e.g., business and pleasure), and congestive situations, and the subsequent effects on WTP values. How participants view travel costs (aggregation of all costs incurred in the activity, e.g., tire wear) was also a concern; respondents should have treated them as an "admission cost," but whether they did is not clear.

Contingent Valuation Method (CVM)

CVM is defined as

> estimating National Economic Development (NED) benefits by directly asking individual households their willingness to pay for changes in recreation opportunities at a given site. Individual values may be aggregated by summing willingness-to-pay for all users in the study area (U.S. Water Resources Council, p. 20).

In 1979, willingness-to-pay and willingness-to-sell (WTS) techniques were implemented by Bishop and Herberlein as part of a contingent valuation study (CVM). This CVM analysis was unique in that it prompted "yes" or "no," discrete (dichotomous choice) replies. Discrete analysis, using a logit technique, could be applied ("yes" equalling 1 and "no" equalling 0), giving a probability of some action occurring. This contingent valuation was contrasted with the travel cost method (TCM) for analyzing outdoor recreation to estimate a consumer's surplus for goose hunting permits in Wisconsin.

Bishop and Herberlein pointed out the advantages of CVM as an alternate measure, but it, too, has its bias. For example, there may be incentives for individuals to alter their responses to inflate or deflate values. If participants wanted an increase in the supply of a good (e.g., more recreation), then they might inflate their responses. On the other hand, if respondents thought the price of the activity was too high or that the fee would be reduced, they might deflate their answers.

In 1984, Hanemann examined Bishop and Herberlein's study with respect to Hicksian compensating and equivalent welfare measures.

Hanemann identified a flaw in Bishop and Herberlein's procedure and suggested a different method which incorporated utility-maximizing responses. He discussed three welfare measures, two of which did not change when monotonic transformations on the utility functions were performed. Finally, WTP was analyzed using equivalent consumer surplus.

Hanemann proposed that utility for hunters could be obtained from hunting and money. Further, h delineated the hunting variable, which would equal "1" if a respondent had a permit or "0" if the hunter did not have a permit. Income information was represented by y, and other socioeconomic data were represented by s. Thus, those who were able to hunt had a utility function of

$$\mu_1 = \mu(1, y; s)$$

while those who were not able to hunt were represented by

$$\mu_0 = \mu(0, y; s) .$$

Since researchers may not be able to observe all aspects of the utility function, they are treated as stochastic, thus helping to derive the stochastic structure of the binary response model (Hanemann). Hanemann stated that μ_0 and μ_1 are random variables whose means depend on observable characteristics. Alternatively,

$$(1) \qquad \mu(j, y; s) = v(j, y; s) + \epsilon_j ,$$
$$j = 0, 1 ,$$

where ϵ_0 and ϵ_1 are error terms with independent random variables and zero means.

The probability distribution of the random variable is:

(2)

$$P_0 \equiv Pr(\textit{individual willing to sell}) = Pr\{v(0, y + A; s) + \epsilon_0 \geq v(1, y; s) + \epsilon_1\}$$
$$P_1 \equiv Pr(\textit{individual unwilling to sell}) = 1 - P_0$$

where A represents the amount of money offered to participants. This gives us the utility maximization formula.

Hanemann showed that income effects do not occur in discrete probability choices. Bishop and Herberlein used a natural log form of the model; however, Hanemann pointed out that Bishop and Herberlein's proposed logit model Δv cannot be generated

(3) $$\Delta v = \gamma_0 + \gamma_1 \ln A$$

from the indirect utility model

$$v(j, y; s), \quad j = 0, 1 .$$

Thus, Hanemann argued, Bishop and Herberlein's model is not strictly compatible with the utility-max hypothesis (Hanemann).

Hanemann derived a hunter's minimum selling price for the permit. Letting s and y keep their properties discussed earlier, and with C representing quantity, then

(4) $$\mu(0, y + C; s) = \mu(1, y; s) ,$$

where C is considered a random variable, even though individuals are fully aware of their own preferences. In order to find a reliable estimate of the permit, Hanemann proposed several methods.

First, solve for C by combining equations (1) and (4)

(5) $$C = m[v(1, y; s) + \eta, 0; s] - y ,$$

where η is the error term of $v(\cdot)$, and where $m(y,j;s)$ (the expenditure function) is the inverse of $v(j,y;s)$. C is stochastic since it is an increasing transformation of η. If

(6) $$v(j, y; s) = \alpha_j + \beta_y, \beta > 0, j = 0, 1$$

and α_0, α_1, and β are functions of s, then

(7) $$\Delta v = (\alpha_0 - \alpha_1) + \beta A .$$

If C follows (6), then

(8) $$C = (\alpha_1 - \alpha_0 + \eta)/\beta ,$$

which can be interpreted as the expectation of the hunter's minimum selling price when $E(\eta) = \epsilon_1 - \epsilon_0 = 0$. Thus,

(9) $$C^* = (\alpha_1 - \alpha_0)/\beta ,$$

where C^* is the observer's expectation of money which would have to be given to hunters who forfeited the hunting permit to make them as well off as they were with the permit. By definition, compensating variation is the change in

income necessary to keep the consumer at his/her original indifference curve (Varian).

This contrasts with the second method, equivalent variation, which Varian defined as the amount which would have to be taken away from the consumer without a price change to leave him/her as well off as he/she would be after the price change (Varian). Equivalent variation is stated by Hanemann as

(10) $$E\{\mu(0, y + C^{**}; s)\} = E\{\mu(1, y; s)\} ,$$

which suggests the amount of money that would have to be given to hunters who give up a permit in order to make them as well off as when they had it, again based on the researcher's expectation of the participant's utility.

Stated another way, hunters were willing to sell only if the offer (A) was greater than their minimum selling price ($C \leq A$); they would refuse anything else. The probability of accepting the offer can be written as

(11) $$P_0 = Pr\{C \leq A\} = G_0(A) .$$

According to Hanemann, when P_0 is graphed as a function of A, then C^* is the median of C; C^* lies on the A axis, where $P_0 = 0.5$ (see figure 1).

Note that C^+ does not have a maximum bid; therefore, the tail does not terminate and C^+ continues into infinity. If the maximum bid allowed is \$200, as stipulated in Hanemann's study, the tail does not go into infinity and C' is limited. It is clear that C' is a more realistic measure of welfare when a

maximum constraint exists. Hanemann pointed out that the difference between C^* and C' is infinite in the limit.

A comparable model for willingness to pay (WTP) was proposed using (2), by subtracting A and using the ending situation (P_1):

$$
\begin{aligned}
P_1 &\equiv Pr\{\textit{individual willing-to-pay}\} \\
&= Pr\{v(1, y-A; s) + \epsilon_1 > v(0, y; s) + \epsilon_0\}\,, \\
P_0 &\equiv Pr\{\textit{individual unwilling-to-pay}\} = 1 - P_1\,.
\end{aligned} \tag{12}
$$

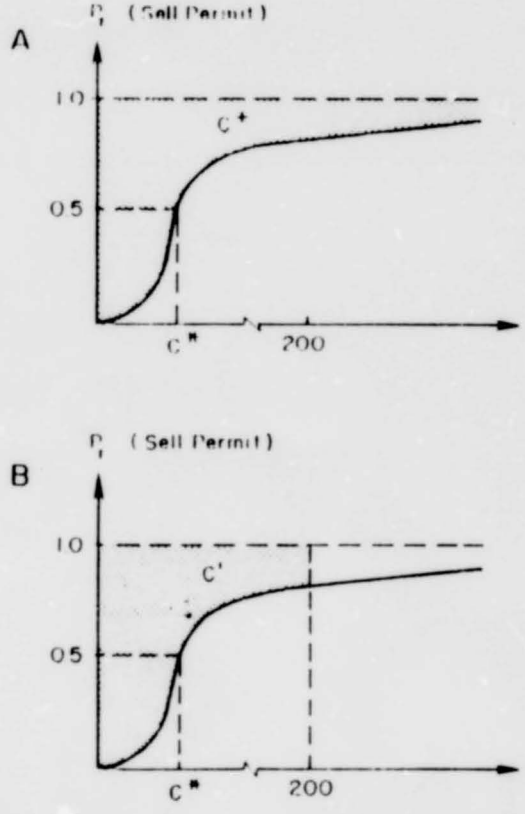


Figure 1. Untruncated (A) and truncated (B) compensating surplus

To get Δv, subtract βA:

(13) $$\Delta v = (\alpha_1 - \alpha_0) - \beta A \ .$$

A graph similar to the compensating variation (***CV***) figure can be drawn. This inverted graph is known as equivalent variation (***EV***). The intercept is ***A***, while β is the slope (see figure 2). This measures equivalent surplus with untruncated and truncated responses. Again, the more applicable situation is reflected in the constrained (truncated) bid, eliminating an even larger area than the truncated compensating surplus.

Hanemann noted that the median of distribution of CV and EV appeared to be more robust, stipulating that researchers need to recognize the type of

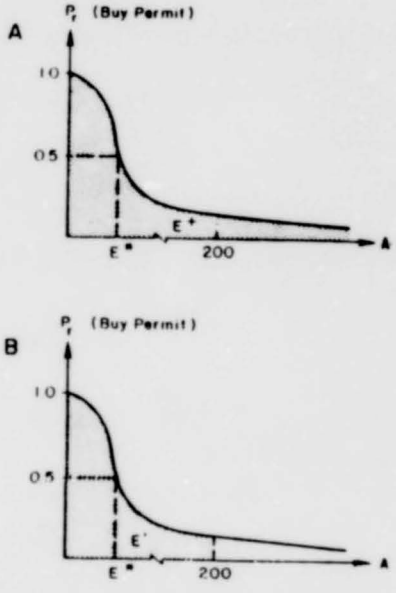


Figure 2. Untruncated (A) and truncated (B) equivalent surplus

welfare measure (compensating v. equivalent) as well as the appropriate model. He also pointed out that these rather simplified models may be applied to other experiments.

Logit

Gujarati explained the logit model as the probability of a positive outcome depending on other variable(s). Gujarati expressed it as follows

$$P_i = E(Y = 1 | X_i = \beta_1 + \beta_2 X_i)$$
$$= 1 \setminus 1 + e^{-(\beta_1 - \beta_2^{X_i})},$$

where P_i is the probability of a given outcome, $Y = 1$ when the probability is 100%, X is the independent variable, and $\beta_1 + \beta_2 X_i$ is the intercept and slope, respectively. Further, e represents the natural logarithm, which is alternatively stated as (Gujarati)

$$P_i = 1 / 1 + e_i^z .$$

In contrast, the probability of a given outcome not occurring is

$$1 - P_i = 1 / 1 + e_i^z .$$

The "odds ratio" is as follows

$$P_i / 1 - P_i = 1 + e^{zi} / 1 + e^{-zi} = e^{zi}$$
$$L_i = \ln e^{zi} = Z_i = \beta_1 + \beta_2 X_i .$$

Thus, the estimation is linear in the parameters (Gujarati).

Gujarati pointed out the following characteristics of the logit model:

1. As ***P*** goes from ***0*** to ***1***, ***L*** or ***Z*** go from $-\infty$ to ∞, the probabilities are bounded, unlike the logit or ***z*** values.
2. ***P*** is not linear even though ***L*** is linear in ***X*** (see logit figure).
3. β_2 is the slope of the independent variable ***X*** and monitors the change in ***L*** as ***X*** varies.

Figure 3 shows the graphical difference between the probit and logit models. The two are comparable; however, the probit does come closer to the axes more quickly than the logit curve (Gujarati).

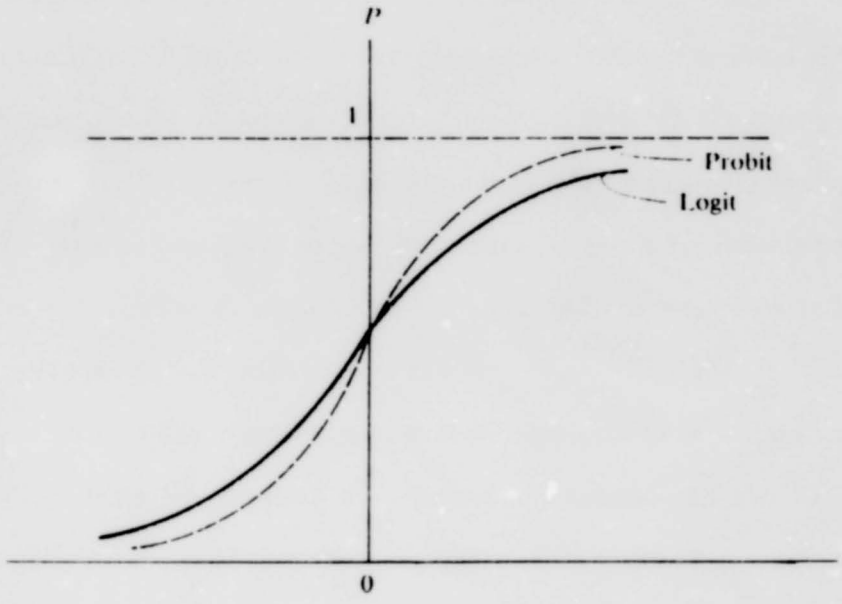


Figure 3. Logit and probit cumulative distributions (Gujarati)

Comparing TCM and CVM

Bishop and Herberlein selected three separate random samples for CVM and TCM pertaining to hunters participating in a goose hunt by permit. The first group to be sampled was offered a cash incentive to return the permit ranging in amounts from $1 to $200. Hunting permit holders could keep the money and return their right to hunt or send back the money and retain the permit. The second group sampled was sent questionnaires requesting their hypothetical willingness to sell the permit, while the third group was sent surveys to derive TCM data. The cash sample gave a total consumer surplus (compensating variation) of $880,000 or $63 per permit, noting the bias due to the maximum payment of $200 that truncated the curve. This was compared to the WTS (CVM) results, which generated a 60% higher value of $101 per permit, while it too was truncated at $200. WTP (CVM) results were much smaller at $21 per permit. TCM values varied depending on the value of time given as a percentage of wages. For a time value of zero, surplus per permit was $11. However, when a time value of half the wage rate is included, surplus per permit quadruples to $45.

Bishop and Herberlein conducted examinations of willingness to sell (WTS) using hypothetical and simulated markets. In the hypothetical situation, those holding permits were offered up to eleven amounts of money which they could accept or reject; the participants did not know the upper

limits of the remuneration. In the simulated market actual money was used, whereas in the hypothetical market it was not.

CHAPTER 4

DATA COLLECTION

General Discussion

In order to value recreation at the proposed project using TCM, data on event variables (type of activity) by boaters and fishermen in Utah were required. Due to project requirements, two types of TCM data sets were combined. The first set was a monthly record of trips taken by a sample of boaters and anglers for the period January 1, 1991 to June 30, 1991. The second set was obtained by asking a separate (and mutually exclusive) sample of registered boaters to recall their trip activity for the period July 1, 1990 to December 31, 1990.

One of the problems in using two different sets of data was the nature of the surveys themselves, which may have affected the quality of the results. The recall data prompted respondents for six months of aggregated trip information by site, including number of trips, types of activities, and expenses. Recall data also elicited vehicle information, and socioeconomic and gear data, unlike the monthly survey. On the other hand, the monthly data gave more detailed information on each trip as well as fishing licenses and unlicensed children's fishing habits.

In addition, a closed-end dichotomous choice CVM survey was mailed to the recall respondents eliciting responses about annual fees, visitation congestion, and drawdown at the proposed new site.

Travel Cost Method (TCM)

First Type

A three-page survey was mailed to a sample of 848 registered boaters and licensed anglers, of which 300 responded. In addition to trip-specific data, there also were obtained boat information, towing vehicle information, boat storage data, boat use, recreating activity, and selected socioeconomic data. This first survey requested the above information for the period of July 1, 1990 to December 31, 1990. This data set is referred to as the recall survey.

A distinction that should be noted is the aggregation of trip information over a six-month period in the recall survey. This especially could be a problem for trip information where averages are required. The same boat information and more detailed vehicle specifics than the second type survey were requested. Responses for boat storage and costs were solicited. If the respondent stated he/she had gone boating during the period in question, then the person would give detailed but aggregated data on trip information.

Second Type

The second survey, to which 800 responded, asked for monthly activity and had a somewhat different focus from the recall survey. Questions pertained to fishing licenses, unlicensed children fishing, boat information, whether or not the respondents participated in boating and/or fishing, and specific trip information. Socioeconomic data were not requested, neither were

boat gear nor tow vehicle data. This lack of continuity could be a source of bias in aggregating the recall and monthly data.

For the monthly survey, questions were asked concerning fishing licenses and boat registration. If the participants had been fishing and/or boating for that given month, then specific trip information was requested. A maximum of ten trips could be reported. Exact dates, whether the site was a lake or stream, and site names were requested. A problem that ultimately made the estimated mileage so variable was the fact that people did not respond to mileage if a trip did not begin from home. Moreover, the type of vehicle, one-way travel time, number of days at the stated site, and main and peripheral activities were also requested. Data were collected for number of days fishing and cold and warm water fish caught and kept. Expenses included all costs above regular at-home expense, plus boat gas and oil. Other requested information included: number of persons and families involved in the trip, whether or not the participants have visited the site before and number of times, and, finally, the overall trip satisfaction rating (ranging from the lowest, 1, to the highest, 7).

Estimated Mileage

One of the most important factors in the TCM is the estimated mileage from origins to destinations. This involved measuring distances from origins to sites, coupled with calibrated distance keys. By multiplying the distance traveled by $0.22 per mile (the average cost of state vehicles in Utah as

reported by the Utah Motorpool), an estimate of actual travel cost was obtained. This estimated mileage should be distinguished from the mileage asked for on the monthly survey in the cases for which the respondents did not start their trip from home. In the recall survey, there was no prompt for mileage. Due to varying degrees of responses in the monthly survey to the mileage question, the estimated mileage from home to the site for both sets of data was used. Although estimated mileage predicted the ultimate measure of value or willingness to pay, many variables were considered from the recall and monthly questionnaires.

Data from both surveys were compared to assure compatibility (Keith, Fullerton, and Williams). LIMDEP (a statistical software package) proved quite effective in dealing with the selectivity bias and missing value problems in the data sets.

The first stage of the Heckman (1976) approach uses a logit model to find the probability of participants taking a trip as a function of a set of independent variables and the number of trips taken in the last five years. The second stage estimates the number of trips using trip-specific data. Truncation problems for TCM concerned the participant taking a trip or not. This was reflected as a one or zero in the first step of the estimation for the TRIPQ variable. Since these data sets included individuals who did not take a trip, the data were truncated at 0 trips, which has been shown to bias results. The Heckman model allows this selectivity bias to be measured.

Sample Selection Bias

Heckman published a number of works on the subject of selectivity bias. In *Econometrica*, Heckman (1979) defined this bias as results from nonrandomly selected samples, analyzing a two-stage least-squares model and creating an asymptotic distribution.

Missing data are usually the dominant factor involved in this type of bias. Heckman (1979) argued that even when selection bias exists, estimation of deleted variables may be possible. By plugging the estimates of the missing variables into the equation for the amount of the dependent variables, behavioral functions may be derived. This is done by defining the asymptotic distribution of the estimator in the general case, as was discussed in Heckman's earlier work (Heckman 1976).

Heckman stated the two reasons for sample selection bias as self-selection by participants and selection by researchers. For example, analysts may exhibit selection bias by only including complete observations; that is, if the complete survey was not filled out, the researcher would not consider it in the sample.

Heckman used a two-equation model to illustrate several points. One indication of selection bias is that variables not belonging to the correct structural equation can be statistically significant when regressions are fit on selected samples. Another is the development of the "Tobit" model from a

given specification. The Tobit adjusts $Q = f(x)$ for those observations for which $Q = 0$; for example, it adjusts $\hat{Q}$ for $P(Q > 0)$. Heckman stressed the importance of multivariate adaptations of the given bivariate model (Heckman 1976).

Heckman (1976) explained a simple estimator for normal disturbances and their properties using a bivariate normal density. The inverse Mill's ratio is defined as

(1) $$\lambda_i = \phi(Z_i)/1 - \Phi(Z_i) = \phi(Z_i)/\Phi(-Z_i),$$

where ϕ is the density function, and Φ is the distribution function,

(2) $$Z_i = X_{2i}\beta_2/(\varphi_{22})_{1/2}.$$

Heckman stated that λ_i is a monotonic decreasing function of the probability that an observation will be selected for the sample. The inverse Mill's ratio represents an independent variable in the regression of number of trips taken, which accounts for the probability of a 0 observation (Keith, Fullerton, and Williams).

Heckman (1976) expounded that, in reality, λ_i is not known but can be estimated (if X_{2i} is known for $Y_{2i} \leq 0$) using a four-step process. The first step is evaluating the probability that $Y_{2i} \geq 0$ using probit analysis, in which case Y_{2i} may be found using ordinary least-squares (OLS). For example,

$\beta_2/(\sigma^{22})^{1/2} = \beta_2^*$. Secondly, B_2^* leads to $\mathbf{Z}_i$, which is used to find λ_i, all of which are consistently estimated. The derived value of λ_i is plugged into the subsample (for which $\mathbf{Y}_{2i}$ is a regressor.) Finally, σ_{11} is found by calculating $C = \rho(\sigma_{11})^{1/2} = \sigma_{12}/(\sigma_{22})^{1/2}$.

The article essentially discussed bias from nonrandomly selected samples. Further, it gave a method using simple regression techniques to form a "selection bias free" behavior function from a censored sample (censored--some data missing, truncated--$y \geq a$ [a is usually 0] for all observations, and self-selection--individual data is a function of the independent variable.) Heckman (1979) elaborated on asymptotic properties of the estimator by encouraging the use of the simple estimator in models involving truncation, sample selection, and limited dependent variables.

In a more recent publication, Heckman (1990) used union and nonunion wages to support his analysis of selection bias. In this work he attempted to answer such questions as, "What are the parameters of economic interest"? Heckman implied that these parameters are not usually defined clearly and are often inconsistent. He analyzed selection bias estimators and how the parameters are not clear, which has led prior researchers to a wide array of estimates and caused them to abandon these types of bias situations.

This study, like much of Heckman's work, dealt with selectivity bias, which is often a problem when soliciting WTP values from recreators. This process allows incomplete surveys to be used.

Contingent Valuation Method (CVM)

Like TCM, CVM looked at willingness-to-drive, as well as the annual fee. And like TCM, CVM respondents were truncated at 0 trips to the new reservior site supporting the use of the Heckman approach, as well. For the CVM data, questions were asked regarding the value of the use of a new reservoir, reduced crowding, and reduced drawdown. In the first question, respondents were asked to indicate whether they would travel to a new reservoir at a specific distance, how many times they would be likely to visit the reservoir in a year, and how many times they would visit other sites. The randomly assigned distance varied between 25, 50, and 100 miles. The second question cross-referenced the first, asking if the respondents would be willing to pay an annual fee of $10, $20, or $40 at the distance specified in the first question. The congestion situation was illustrated with two photographs showing a congested and uncongested setting for the proposed site. Again, the respondents were asked if they would be willing to pay $10, $20, or $40, in addition to any current fee, for the uncongested setting. The drawdown question asked whether the respondent would be willing to pay $10, $20, or $40 to avoid interference with access to boat ramps and shorelines by drawdown, in addition to any current fee. (For a more complete description of

drawdown, see Appendix A.) These questions were stated as dichotomous choice (yes or no) questions, with an indicator of protest responses if they answered "no." Appendix B lists site names and numbers. See Appendix C for complete surveys.

A new variable representing the number of substitutes was used for each of the county group origins. This value was calculated by finding the center of the seven county groups, drawing circles with a radius (one-way distance) of 30, 75, 150, and greater than 150 miles. The number of substitutes was found by counting the number of sites within the concentric circles. The number of substitutes has been proposed as influencing a respondent's willingness to travel. For example, if there were a large number of sites close to boaters, then willingness to travel to distant sites would tend to be less than if there were fewer sites near by.

Table 1 shows the number of substitute sites within 30 miles, 30 to 75 miles, 75 to 150 miles, and greater than 150 miles radii of the county origin population centers. Table 2 shows the number of registered boaters by region.

Table 1. Number of Utah Boating and Fishing Sites Within Each Region for 30-, 75-, 150-, and Greater Than 150-Mile Radii With Centers and Populations

Region	Center (Popul.)	# of Sites Within 30 Miles	30 to 75 Miles	75 to 150 Miles	> 150 Miles	Total
Bear River (1)	Logan (111,950)	14	11	39	31	94
Central (2)	Richfield (55,250)	4	19	39	39	94
Mountainland (3)	Provo (291,000)	10	36	36	12	94
Southwestern (4)	St. George (78,400)	3	3	16	72	94
Uintah Basin (5)	Vernal (34,450)	5	9	51	29	94
Southeastern (6)	Green River (52,300)	0	5	58	30	94
Wasatch Front (7)	Salt Lake City (1,091,650)	8	40	24	22	94

Table 2. Number of Registered Boaters in Utah by Region for 1992

Region	Counties	Number of Boaters
Region 1 (Logan)	Cache, Rich, Box Elder	2,750
Region 2 (Richfield)	Juab, Millard, Piute, Sanpete, Sevier, Wayne	2,466
Region 3 (Provo)	Summit, Utah, Wasatch	7,435
Region 4 (Green River)	Carbon, Emery, Grand, San Juan	1,177
Region 5 (St. George)	Beaver, Iron, Kane, Garfield, Washington	3,741
Region 6 (Vernal)	Daggett, Duchesne, Uintah	1,589
Region 7 (Wasatch Front)	Davis, Morgan, Salt Lake, Tooele, Weber	30,282
TOTAL		50,140

CHAPTER 5

MODEL AND RESULTS

Travel Cost Method (TCM)

A test for differences between the two TCM samples (recall and monthly) was run. Variables common to both samples were compared with respect to means and variances for each of the seven regions as given by the Bureau of Economics and Business Research (BEBR). No discernible statistical difference was found. The list of variables included: trip activity, boat price, expenses per trip, and rate of satisfaction for the site. Generally, the means of the samples were within one standard deviation of each other. Given the consistency of the two samples, the recall and monthly data were combined for a full year's worth of analysis.

The two-stage estimation was used following Heckman (1976), assuming that the respondent decided first to recreate and then chose the site. The inverse Mill's ratio was calculated in the first step and used in the second stage of the equation--estimation of number of trips taken. As discussed by Heckman, this represented the truncation effect or the probability of a positive response given the level of the independent variables in the logit equation.

The probability that the respondent took a trip was estimated as a function of the independent variables: the intercept (ONE) and the number of visits in the last five years (YR5VIS). The second step used the maximum likelihood estimates of the number of trips taken during the year by the

respondent as a function of the intercept, the distance in miles times the cost per mile, and Mill's ratio (lambda). The first step results are found in tables 3 and 4.

From this, travel-cost-based demand curves for each region, adjusted for the truncation bias, were calculated. By integrating these demand curves, consumer surplus was derived. The upper and lower range of distances observed for each region served as limits or bounds of integration. Calculations varied between $23.22 and $413.60, averaging about $150 per trip for each region.

This high value may be due in part to large, distant sites which have few substitutes, such as Lake Powell, Flaming Gorge, and Bear Lake. The 1,500 square acre reservoir described in the CVM survey could expect a significantly smaller value. Tables 3 and 4 show results for two estimates--one excluding Lake Powell, Flaming Gorge, and Bear Lake, and the other including them. Below, the two sets of travel cost demand equations are compared.

Since we looked at the Bear River Project only, we assumed no trips for other regions. Then we calculated an average consumer surplus per boater for regions 1 and 7. Then we assumed that the average number of trips to the new site would be the same as for the observed trips; then we multiplied consumer surplus per boater times the number of registered boaters for each region. Note: Lambda represents the Mill's ratio coefficient.

Table 3. Travel Cost First- and Second-Step Estimations: Excluding Flaming Gorge, Lake Powell, and Bear Lake

Region	First-Step Estimations	Second-Step Estimations
Region 1 (Bear River) (t-statistics)	Probability of taking a trip = -1.25 + .027 (-2.0) (1.8) (# of visits in last 5 years)	Number of trips = 11.200 - 0.0141(cost) - 5.26(lambda) (2.7) (-1.8) (-1.2)
Region 2 (Richfield)	Too few observations	Too few observations
Region 3 (Provo) (t-statistics)	Probability of taking a trip = 1.45 - .037 (1.1) (0.4) (# of visits in last 5 years)	Number of trips = 6.288 - 0.0560(cost) - 21.3(lambda) (6.7) (-2.1) (-.41)
Region 4 (Green River) (t-statistics)	Probability of taking a trip = -1.435 + .0158 (-1.8) (.35) (# of visits in last 5 years)	Number of trips = 1.119 - .0003(cost) + .0008(lambda) (.5) (-.3) (.00)
Region 5 (St. George) (t-statistics)	Probability of taking a trip = -1.86 + .002 (-0.3) (0.4) (# of visits in last 5 years)	Number of trips = 3.478 - 0.0317(cost) - 7.2(lambda) (5.1) (-2.6) (-.51)
Region 6 (Vernal) (t-statistics)	Probability of taking a trip = 2.76 - .125 (6.0) (-3.2) (# of visits in last 5 years)	Number of trips = 6.469 - 0.0074(cost) - 4.26(lambda) (6.9) (-2.4) (-1.1)
Region 7 (Wasatch Front) (t-statistics)	Probability of taking a trip = 1.03 - .003 (0.6) (-0.3) (# of visits in last 5 years)	Number of trips = 3.847 - .0360(cost) + 32.08(lambda) (26.8) (-9.0) (.36)

Table 4. Travel Cost First and Second Step Estimations: Including Flaming Gorge, Lake Powell, and Bear Lake

Region	First-Step Estimations	Second-Step Estimations
Region 1 (Bear River) (t-statistics)	Probability of taking a trip = -.351 + .0202 (-.75) (1.6) (# of trips in the last 5 years)	Number of trips = 9.41 - 0.00865(cost) - 6.1(lambda) (2.6) (-1.99) (-1.2)
Region 2 (Richfield)	Too few observations	Too few observations
Region 3 (Provo) (t-statistics)	Probability of taking a trip = .67 + .024= (0.7) (-0.1) (# of visits in the last 5 years)	Number of trips 7.322 - 0.01117(cost) -17.3(lambda) (1.9) (-2.37) (-.43)
Region 4 (Green River) (t-statistics)	Probability of taking a trip = .247 + .0015 (1.7) (0.2) (# of visits in the last 5 years)	Number of trips = 1.209 - 0.00031(cost) - .085(lambda) (.54) (-.25) (-.03)
Region 5 (St. George) (t-statistics)	Probability of taking a trip = .06 + .08 (0.6) (0.0) (# of visits in the last 5 years)	Number of trips = 2.898 - 0.01576(cost) - 4.7(lambda) (5.6) (-2.8) (-1.1)
Region 6 (Vernal) (t-statistics)	Probability of taking a trip = 2.619 - .076 (2.1) (1.8) (# of visits in the last 5 years)	Number of trips = 5.548 - 0.00971(cost) - 3.18(lambda) (13.7) (-4.1) (-2.0)
Region 7 (Wasatch Front) (t-statistics)	Probability of taking a trip = 1.15 - .002 (0.2) (0.5) (# of visits in the last 5 years)	Number of trips = 3.23 - 0.00986(cost) - .062(lambda) (28.9) (-5.4) (-.02)

After calculating the average consumer surplus per boater for each region, total recreation benefits for each region were found by multiplying consumer surplus by the number of registered boaters in the region. For the travel cost demand equations, including the large sites, $949.17 per boater was calculated, totaling $2,610,217 for region 1. For region 7, consumer surplus came to $77.98 per participant, totaling $2,361,390. Total benefits for this second equation came to $4,971,607 (see table 5). This equalled $3,470,500 annually. Using $150 per boater for region 7 and multiplying by the number of registered boaters, the total annual benefits for that region would be $4,542,300. When totaled, the estimated benefit, excluding large sites, from the Bear River Water Development Project equalled $8,012,800 annually (see table 6).

Table 5. TCM--Total Recreation Benefits for Bear River Water Development Project from Regions 1 and 7, Excluding Lake Powell, Flaming Gorge, and Bear Lake

	Consumer Surplus per Boater	Number of Registered Boaters per Region	Total Benefits
Region 1	$949.17	2,750	$2,610,217
Region 7	77.98	30,282	2,361,390
TOTAL			$4,971,607

Table 6. TCM--Total Recreational Benefits for Bear River Water Development Project from Regions 1 and 7, Including Lake Powell, Flaming Gorge, and Bear Lake

	Consumer Surplus per Boater	Number of Registered Boaters per Region	Total Benefits
Region 1	$1,262	2,750	$3,470,000
Region 7	150	30,282	4,542,300
TOTAL			$8,012,800

Contingent Valuation Method (CVM)

The first step of the regression used the number of increased trips as the endogenous variable and the cost of equipment as the exogenous variable. The second stage of the CVM estimate was a logit estimation. The binary dependent variable was whether or not the respondent would drive 25, 50, or 100 miles. The right-hand side contained the independent variables: intercept, age of respondent, family income, and number of substitute sites within 30, 75, 150, or greater than 150 miles of the origin. Results for the first step are found in table 7, and estimations for the second step are found in table 8.

The CVM survey asked participants how many total trips they would take to the proposed site and how many trips they would take to other sites. Subtracting reduced number of trips to other sites from total trips to proposed

Table 7. CVM First-Step Estimation Results for Probability of Taking a Trip for Annual Fee and Willingness To Drive Using Both Single and Multiple Variable Combinations

Variable Combinatons	1st Step Estimations
Single (t-statistics)	Probability of taking a trip = .98 + .0003 (cost of equipment) (0.5) (-0.2)
Multiple (t-statistics)	Probability of taking a trip = .34 + .0007 (cost of equipment) (0.1) (0.9)
Single (t-statistics)	Probability of taking a trip = 1.3 - .002 (cost of equipment) (1.4) (-1.9)
Multiple (t-statistics)	Probability of taking a trip = 1.14 - .004 (cost of equipmemt) (1.0) (-0.4)

Table 8. CVM Second-Step Estimation Results and Willingness To Pay Calculations for Annual Fee and Wiliingness To Drive Using Both Single Variable Estimations and Multiple Variable Combinations

Variable Combinations	2nd Step Estimation Results	Willingness To Pay
Single (t-statistics)	.169 - .00628*Fee (2.3) (-1.8)	$26.96
Multiple (t-statistics)	.0326 - .0021*Fee - .0019*Age + .036*Income (4.2) (-2.1) (-2.0) (1.7)	33.50
Single (t-statistics)	1.303 - .00697*Miles (3.9) (-3.2)	186.98
Multiple (t-statistics)	2.565-.0093*Miles+.0002*Age-.079*Income (4.0) (-2.2) (1.6) (-1.9) - .062*Sites in 30 Miles (-2.3)	214.86

site generates the increase in net trips. For a list of total trips to the proposed site, reduced trips to other sites, and increase in net trips, refer to table 9. This table indicates a decreasing mean number of trips to the proposed site as one-way mileage increases from 25 to 50 to 100 miles, from 7.59 to 4.22 to 3.86, respectively. When the mean number of reduced trips to other sites is subtracted (2.21, 0.66, 1.72, respectively) from trips to the proposed site, an increase in mean net trips was generated (5.38, 3.56, and 2.14, respectively).

It was hypothesized that as the number of nearby substitute sites increased, the willingness to drive to farther sites would decrease. However, the number of substitute sites within 30 miles for both the 25-mile and the 50-mile CVM respondents generally lacked statistical significance. However, for the 100-mile CVM survey, substitute sites within the 30- to 75-mile and 75- to 150-mile areas did give significant and negative coefficients. This indicated

Table 9. Total Trips, Reduced Trips, and Increased Trips for 25, 50, and 100 Miles, and Associated Fees from CVM Surveys

Survey Type	Total Trips to Proposed Sites	Reduced Trips to Other Sites	Increase in Net Trips
25 miles ($10)	7.59	2.21	5.38
50 miles ($20)	4.22	0.66	3.56
100 miles ($40)	3.86	1.72	2.14

that as the number of substitutes within those areas increased, the number of 100-mile trips would decrease. Substitutes within 30 miles were of little consequence for boaters and anglers and trips within 30 miles were treated as a fixed cost, as though they expected to travel at least 30 miles. However, the 25- and 50-mile CVM respondents did not reflect this kind of behavior. This might have illustrated bias triggered by the shorter or longer willingness-to-drive surveys.

Table 10 shows results from the question explaining willingness to pay for an annual entrance fee generated values of $26.96 for the single variable regression and $38.50 when age and income were added. When the entrance fee results were divided by the average number of net trips to the proposed reservoir (3.05), willingness to pay per net trip equalled between $8.84 (26.96/3.05) and $12.62 (38.50/3.05). The willingness-to-travel question has values seven times that of the willingness to pay an annual fee. For the single variable estimation, willingness to pay was $186.98. When age, income, and substitute sites within 30 miles were included in the equation, willingness to pay was $214.86. When the willingness-to-drive values were divided by the average number of net trips to the proposed reservoir (3.05), willingness to pay per trip equalled $61.30 ($186.98/3.05) and $70.45 ($214.86/3.05), respectively (see tables 10 and 11).

Table 10. Consumer Surplus per Trip per Participant for Fee

Variable Combinations	WTP (from table 10)	Average # of Trips	Consumer Surplus per Trip
Single	$26.96	3.05	$8.84
Multiple	38.50	3.05	12.62

Table 11. Consumer Surplus per Trip per Participant for Distance

Variable Combinations	WTP (from table 10)	Average # of Trips	Consumer Surplus per Trip
Single	$186.98	3.05	$61.30
Multiple	214.86	3.05	70.45

Assuming all participants originated from the center of the county group regions, consumer surplus was calculated by multiplying additional trips by the single- and multiple-variable estimates. Using both the single- and multiple-variable estimations for willingness to pay the annual fee and willingness-to-drive estimations, and multiplying them by the average number of net trips for a given distance (25, 50, and 100 miles), the upper and lower sets of consumer surplus estimates were found. See tables 12 to 17 for complete results.

Table 12. Fee-Based Consumer Surplus per Participant (Single and Multiple Variables) for 25-Mile Survey

Variable Combinations	Consumer Surplus/ Trip/Participant (from table 10)	Additional # of Trips (from table 9)	Consumer Surplus per Participant
Single	$8.84	5.4	$47.74
Multiple	12.62	5.4	68.15

Table 13. Fee-Based Consumer Surplus per Participant (Single and Multiple Variables) for 50-Mile Survey

Variable Combinations	Consumer Surplus/ Trip/Participant (from table 10)	Additional # of Trips (from table 9)	Consumer Surplus per Participant
Single	$8.84	3.5	$30.94
Multiple	12.62	3.5	44.17

Table 14. Fee-Based Consumer Surplus per Participant (Single and Multiple Variables) for 100-Mile Survey

Variable Combinations	Consumer Surplus/ Trip/Participant (from table 10)	Additional # of Trips (from table 9)	Consumer Surplus per Participant
Single	$8.84	2.1	$18.56
Multiple	12.62	2.1	26.50

Table 15. Destination-Based Consumer Surplus per Participant (Single and Multiple Variables) for 25-Mile Survey

Variable Combinations	Consumer Surplus/ Trip/Participant (from table 10)	Additional # of Trips (from table 9)	Consumer Surplus per Participant
Single	$61.30	5.4	$331.02
Multiple	70.45	5.4	380.43

Table 16. Distance-Based Consumer Surplus per Participant (Single and Multiple Variables) for 50-Mile Survey

Variable Combinations	Consumer Surplus/ Trip/Participant (from table 10)	Additional # of Trips (from table 9)	Consumer Surplus per Participant
Single	$61.30	3.5	$214.55
Multiple	70.45	3.5	246.57

Table 17. Distance-Based Consumer Surplus per Participant (Single and Multiple Variables) for 100-Mile Survey

Variable Combinations	Consumer Surplus/ Trip/Participant (from table 10)	Additional # of Trips (from table 9)	Consumer Surplus per Participant
Single	$61.30	2.1	$128.73
Multiple	70.45	2.1	147.94

Recreation Benefits for Proposed Bear River Resevoir

A reservoir site was proposed on the Bear River in region 1. By multiplying the above two sets of values by the number of registered boaters in regions within 100 miles of this site, total annual recreational benefits to participants in each region were estimated. Since the CVM survey only prompted responses within 100 miles, the two relevant regions and their component counties are region 7 (Wasatch Front-- Davis, Morgan, Salt Lake, Tooele, and Weber Counties) at the 100-mile and 50-mile distances, and region 1 (Bear River--Box Elder, Cache, and Rich Counties) at the 25-mile distance. By multiplying the upper and lower consumer surplus by the number of registered boaters by region, the total recreation benefits for the Bear River Water Project were derived. A range of values was calculated by putting all of region 7 in the 50- or the 100-mile category. See tables 18 to 23 below for complete results.

Table 18. Total Fee-Based Recreation Benefits in Region 1 Within 25-Mile Band

Variable Combinations	Consumer Surplus/ Participant (from table 12)	# of Registered Boaters in Region 1 (from table 2)	Total Benefits Within 25 Mile Radius
Single	$47.74	2,750	$131,285
Multiple	68.15	2,750	187,413

Table 19. Total Distance-Based Recreation Benefits in Region 1 Within 25-Mile Band

Variable Combinations	Consumer Surplus/ Participant (from table 15)	# of Registered Boaters in Region 1 (from table 2)	Total Benefits Within 25 Mile Radius
Single	$331.02	2,750	$910,305
Multiple	380.43	2,750	1,046,183

Table 20. Total Fee-Based Recreation Benefits in Region 7 Within 50-Mile Band

Variable Combinations	Consumer Surplus/ Participant (from table 13)	# of Registered Boaters in Region 7 (from table 2)	Total Benefits Within 50 Mile Radius
Single	$30.94	30,282	$936,925
Multiple	44.17	30,282	1,337,556

Table 21. Total Distance-Based Recreation Benefits in Region 7 Within 50-Mile Band

Variable Combinations	Consumer Surplus/ Participant (from table 16)	# of Registered Boaters in Region 7 (from table 2)	Total Benefits Within 50 Mile Radius
Single	$214.55	30,282	$6,497,003
Multiple	246.57	30,282	7,466,632

Table 22. Total Fee-Based Recreation Benefits in Region 7 Within 100-Mile Band

Variable Combinations	Consumer Surplus/ Participant (from table 14)	# of Registered Boaters in Region 7 (from table 2)	Total Benefits Within 100 Mile Radius
Single	$18.56	30,282	$562,034
Multiple	26.50	30,282	$802,473

Table 23. Total Distance-Based Recreation Benefits in Region 7 Within 100-Mile Band

Variable Combinations	Consumer Surplus/ Participant (from table 17)	# of Registered Boaters in Region 7 (from table 2)	Total Benefits Within 100 Mile Radius
Single	$128.73	30,282	$3,898,202
Multiple	147.94	30,282	4,479,919

TCM

When Lake Powell, Bear Lake, and Flaming Gorge are left in the estimations, region 7 has notably higher recreation benefits. However, when these large sites are excluded, both regions have more equal recreation benefits, as well as 40% lower total recreation benefits. See table 24 for complete results.

CVM

When comparing fee results from regions 1 and 7 (table 25) to distance results for the same regions (table 27), distinctly higher benefits are noted in the distance results. This may be due to recreators treating distance or willingness to drive as a fixed cost or a requirement of boating and fishing. Similar conclusions can be seen between tables 26 and 28 with region 7 in a further radius category.

Table 24. Total Recreation Benefits for Regions 1 and 7, Including and Excluding Large Sites, Respectively

	Region 1	Region 7	Total Recreation Benefits
Including	$3,470,000	$4,542,300	$8,012,800
Excluding	2,610,217	2,361,390	4,971,607

Table 25. Total Fee-Based Recreation Benefits for Regions 1 and 7 at 25-Mile and 50-Mile Radii for CVM Data

Variable Combinations	Region 1 at 25 Miles (from table 18)	Region 7 at 50 Miles (from table 20)	Total Recreation Benefits
Single	$131,285	$936,925	$1,068,210
Multiple	187,413	1,337,556	1,524,969

Table 26. Total Fee-Based Recreation Benefits for Regions 1 and 7 at 25-Mile and 100-Mile Radii for CVM Data

Variable Combinations	Region 1 at 25 Miles (from table 18)	Region 7 at 100 Miles (from table 22)	Total Recreation Benefits
Single	$131,285	$562,034	$693,319
Multiple	187,413	802,473	989,886

Table 27. Total Distance-Based Recreation Benefits for Regions 1 and 7 at 25-Mile and 50-Mile Radii for CVM Data

Variable Combinations	Region 1 at 25 Miles (from table 19)	Region 7 at 50 Miles (from table 21)	Total Recreation Benefits
Single	$910,305	$6,497,003	$7,407,308
Multiple	1,046,183	7,466,632	8,512,815

Table 28. Total Distance-Based Recreation Benefits for Regions 1 and 7 at 25-Mile and 100-Mile Radii for CVM Data

Variable Combinations	Region 1 at 25 Miles (from table 19)	Region 7 at 50 Miles (from table 21)	Total Recreation Benefits
Single	$910,305	$3,898,202	$4,808,507
Multiple	1,046,183	4,479,919	5,526,102

Table 29. Comparing TCM and CVM TRBs Adding Fee and Distance Values Together

	Total Recreation Benefits
TCM for regions 1 and 7	
Including large sites	$8,012,800
Excluding large sites	4,971,607
CVM for regions 1 and 7 at 25- and 50-mile radii (from tables 25 and 27)	
Single variable	8,475,518
Multiple variables	10,037,784
CVM for regions 1 and 7 at 25- and 100-mile radii (from tables 26 and 28)	
Single variable	5,501,826
Multiple variables	6,515,988

When the CVM fee and distance values are added together, as shown in Table 29, they are closer to the TCM values due to asking separate questions. As the number of separate questions increases, the overall aggregate value of the activity increases. When looking at only the fee in the CVM data, it is markedly lower.

The above results suggest that participants may not be treating mileage driven as a recreation cost. This reflects more of a preference for driving than paying an annual fee. There could be numerous explanations for this, including the belief that entrance fees should already be included in taxes and license fees already paid. Further, travel may be viewed as a mandatory exercise in order to participate in boating and/or fishing. The above

willingness-to-drive values are dependent upon mileage costs and are particularly vulnerable to the individual's actual and interpreted expenditures for driving.

It may be more accurate to split the county components of region 7 and calculate both 100- and 50-mile values, rather than one or the other. The above values have a bias downward, because the number of licensed anglers was not included. The 100-mile limit serves as a truncating device, not including those willing to travel (or willing to pay) beyond 100 miles.

CHAPTER 6

CONCLUSIONS AND LIMITATIONS

Conclusions

In this case, CVM may generate the truer WTP, since it considers the value of one additional unit or margin value of an additional reservoir. Unlike CVM, TCM fails to consider the fact that the value of each additional reservoir will decrease for a given angler or boater. In addition, the CVM asked direct questions about specific sites. The TCM analysis aggregated a wide array of site characteristics and attempted to make consumer surplus estimates. On the other hand, TCM elicited actual spending habits of anglers and boaters, not hypothetical expenditures like CVM. The validity of TCM is further weakened by the argument that travel costs should not be considered as a benefit but rather a cost of recreating that administrators cannot capture. Even though recreators are willing to pay a given amount to get to the site, they may not be willing to pay an entrance fee, especially if it is perceived to be included in taxes already paid. Conceivably, user fees may act as a deterrent to recreating at a given site if recreators know, before they expend, the fixed costs of travel.

In conclusion, the CVM results may provide a more reliable estimation of total recreation benefits for the Bear River Water Development Project. It is important to remember that although most of the CVM estimates are less than the TCM benefits, its directness and specificity make CVM more accurate.

Limitations

There are several limitations in this study that should not be overlooked, including the continuing argument over the use of nonmarket techniques. If there is no market, how can the goods be economically quantified?

Many other limitations are specific to this study, such as the lag between the time respondents were queried and when the activity occurred, especially concerning the recall data. This was accounted for by testing variables common to the recall and monthly surveys and comparing means and variances. A fairly small sample size for the CVM study could be considered unrepresentative of the population in question. Human error, too, could account for some degree of erroneous results, including inconsistent estimation of mileage between research assistants. It would have been better if mileage were asked from home, as well as from other sites, to avoid the burden and imprecision of estimating mileage. In addition, participants who answered "no" to starting the trip from home did not give mileage, creating the need for the estimated mileage variable. Variation by respondent could also explain inconsistencies, such as the definition of expense. This may be interpreted as out-of-pocket expenses to some, while others may include opportunity costs of missing work.

Physical differences, too, may explain variation in the results. Large, distant sites with few substitutes, such as Lake Powell, Flaming Gorge, and Bear Lake, may have skewed estimations. However, these differences were

accounted for by extracting those sites and running estimates without these sites. Note the 40% difference in total recreation benefits between tables 9 and 10.

In addition, only boaters were included in the final total benefit calculations, neglecting the angler population. This caused a more conservative downward bias in estimations for CVM and TCM. Another limitation for CVM was that respondents were questioned only about trips within 100 miles. Since the proposed site was in northern Utah, much of the state could not be included in the total recreation benefits. Although the distribution of the surveys was random, the clustering of the highest WTP question with the highest willingness-to-drive question on the same survey was not arbitrary. The same was true for the lowest and middle surveys. Perhaps by mixing the high and low WTP and willingness-to-drive values, a more representative database could have been compiled.

REFERENCES

Bishop, R. C., and T. A. Herberlein. "Measuring Values of Extra-Market Goods: Are Indirect Measures Biased?" *Amer. J. Agr. Econ.* 61(1979): 926-30.

Bockstael, N. E., W. M. Hanemann, and I. E. Strand, Jr. *Measuring the Benefits of Water Quality Improvements Using Recreation Demand Models."* Vol. 2 of *Benefit Analysis Using Indirect or Imputed Market Methods*. Dept. of Ag. & Resour. Econ. Rep. to U.S. Environmental Protection Agency, CR-811043-01-0, University of Maryland, College Park, 1986.

Bureau of Economic and Business Research. "Utah's Economy Continues to Grow in 1989." *Utah Econ. & Bus. Rev.* 50(4, 1989).

Gujarati, D. *Basic Econometrics*. New York: McGraw-Hill, Inc. 1988.

Hanemann, M. W. "Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses." *Amer. J. Ag. Econ.* 66(1984):332-41.

Heckman, J. J. "The Common Structure of Statistical Model of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for such Models." *Ann. Econ. & Soc. Measurement* 5(1976): 475-92.

_____. "Sample Selection Bias as a Specification Error." *Econometrica* 147(1979):153-61.

_____. "Varieties of Selection Bias." *Amer. Econ. Rev.* 80(1990):313-18.

Johnson, T. G. "Measuring the Cost of Time in Recreation Demand Analysis: Comment." *Amer. J. Ag. Econ.* 65(1983):169-71.

Keith, J. E., H. H. Fullerton, and J. T. Williams. "Interim Report Utah Fishing and Boating Study." Department of Economics, Utah State University, Logan. 1991.

Kmenta, Jan. *Elements of Econometrics*. New York: MacMillan Publishing Co. 1986.

Summers, L. "Economic and Financial Summary of the Bear River Water Development Project(s)." Preliminary draft. Utah Division of Water Resources, Salt Lake City. 1991.

U. S. Water Resources Council. *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.* Washington, D.C., 1983.

Varian, Hal R. *Intermediate Microeconomics: A Modern Approach*. New York: W. W. Norton and Company, Inc. 1990.

APPENDIXES

Appendix A:

Drawdown and Its Effects

By using Flaming Gorge as an example, effects of lowering the reservoir on two-boat ramps can be seen. The more the water level is dropped, the shorter the distance between the boat ramp and the reservoir. This contrasts with the southernmost boat ramp, which has a flatter slope. When the reservoir level drops, a longer distance is placed between the boat ramp and the water. By measuring the distance within a specified number of elevation lines, a ratio of horizontal distance per vertical feet dropped may be derived. According to the map, the southernmost boat ramp has a greater distance within four elevation lines than the northernmost ramp and will be more vulnerable to drawdown situations. Drawdown or emptying the reservoir can occur for a number of reasons, most notably to generate power or increase water to communities downstream, both of which may be seasonably dependent.

Appendix B:

List of Site Numbers for Preliminary Data of Boat Survey

List as furnished by UDWR, July 1, 1990 to December 31, 1990 for Dr. John Keith

SITE	SITE NUMBER	SITES USED
LAKE POWELL	=SITE382A	=1
STEINAKER	=SITE740	=2
FLAMING GORGE	=SITE059A	=3
RED FLEET	=SITE738C	=4
STARVATION	=SITE233A	=5
WARNER	=SITE370B	=6
WILLARD BAY	=SITE035	=7
PINEVIEW	=SITE833	=8
BEAR LAKE	=SITE405	=9
UTAH LAKE	=SITE764	=10
DEER CREEK	=SITE733	=11
ROCKPORT	=SITE669	=12
ECHO	=SITE580	=13
STRAWBERRY	=SITE783	=14
SCOFIELD	=SITE053	=15
EAST CANYON	=SITE391	=16
FISH LAKE	=SITE501	=17
LOST CREEK	=SITE392	=18
NEWTON DAM	=SITE043	=19
BLACKSMITH FORK	=SITE040A	=20
SALT CREEK	=SITEAR121	=21
KAUSY	=SITE832	=22
JORDAN	=SITE172	=23
AMERICAN FORK	=SITEAB	=24
BIG SPRING CANYON	=SITE010E	=25
RED CREEK	=SITE210A	=26
VERNON CREEK	=SITE709	=27
HALL CREEK	=SITE170C	=**
MALAD	=SITE020	=28
SETTLEMENT	=SITE707A	=29
THISTLE	=SITEAK030	=30

SITE	SITE NUMBER	SITES USED
NINE MILE	=SITE471	=31
DUCHESNE	=SITEBE	=32
TIBBLE	=SITE762B	=33
BURRISTON PONDS	=SITE377	=34
PALISADES	=SITE473	=35
LOGAN RIVER	=SITE040A	=36
PORCUPINE	=SITE045	=37
KAYSVILLE	=SITE090	=38
OGDEN	=SITE030	=39
SOUTH FORK OGDEN RIVER	=SITEAP030	=40
WALLSBURG	=SITEAF050	=41
HYRUM DAM	=SITE042	=42
BROUGH	=SITE714A	=43
MOON LAKE	=SITE189	=44
JOE'S VALLEY	=SITE287B	=45
GRANTSVILLE	=SITE706AA	=46
SEVIER BRIDGE,YUBA	=SITE490	=47
FORSYTHE	=SITE503	=48
KOLOB	=SITE789	=50
CURRANT CREEK	=SITE780	=51
PROVO RIVER	=SITEAF	=52
WEBER RIVER	=SITEAP	=53
FARMINGTON	=SITE087	=54
WHITNEY	=SITE702A	=55
WIDE HALLOW	=SITE364	=56
QUAIL CREEK	=SITE790B	=57
KENS LAKE	=SITE429B	=**
HOOP LAKE	=SITE605	=58
YOGO CREEK	=SITE200E	=59
MILLSITE	=SITE287C	=60
HUNTINGTON CREEK	=SITEAI130	=61
WOODRUFF CREEK	=SITEAQ200	=62
MILLER'S FLAT	=SITE467	=63
PANGUITCH LAKE	=SITE336	=64
BRIDGER LAKE	=SITE543B	=65
BIG CREEK	=SITEAQ190	=66
POSEY LAKE	=SITE338	=67
UINTAH LAKE	=SITE253	=68
FREMONT RIVER	=SITEAZ130	=69
KOOSHAREM	=SITE508	=70

SITE	SITE NUMBER	SITES USED
JOHNSON	=SITE507	=71
UM CREEK	=SITE130Z	=72
ASPEN MIRROR	=SITE381	=73
SMITH-MOREHOUSE	=SITE679	=74
PAYSON	=SITE758	=75
MIRROR	=SITE187	=76
BIRCH CREEK	=SITE406A	=77
SILVER LAKE	=SITE420	=78
LITTLE BEAR RIVER	=SITEAQ040	=79
DUCK CREEK	=SITEAQ150	=**
BOULDER CREEK	=SITEAJ110	=80
MARSH LAKE	=SITE642	=81
BEAR RIVER	=SITEAQ	=82
BEAVER CREEK	=SITEAK180	=**
BRUSH CREEK	=SITEBJ	=84
OTTER CREEK	=SITE510B	=85
OTTER CREEK RES.	=SITE403	=86
SMITH MOREHOUSE CREEK	=SITEAP400	=87
PIUTE RES.	=SITE404	=88
BULLFROG CREEK	=SITEAN	=**
OAK CREEK	=SITAZ130F	=89
TONY CREEK	=SITE040A13	=90
CORN CREEK	=SITEAA070	=91
DIAMOND FORK	=SITEAK020	=92
MANTUA	=SITE032	=93
BAKER	=SITE785	=94

Appendix C:

Survey Used

1991 FISHING AND BOATING QUESTIONNAIRE

June

Instructions: We are asking you to complete several questionnaires that will be mailed periodically during 1991. However, this questionnaire focuses only on activity during the month(s) stamped in the upper right-hand corner. Please complete each of the following questions. Once the reporting period is over, simply fold and staple this form so that the Utah State University address and stamp are on the front and drop it in the mailbox. If you have any questions, please call Dr. Robert Lilieholm at (801) 750-2575.

1. Have you purchased a license to fish in Utah (for yourself) during 1991?

[✓] YES (Continue with the next question. If you have reported this purchase in previous questionnaires from this study, skip to Question 3.)
[ ] NO (Please skip to Question 3.)

2. What type of license did you purchase?

Resident Annual	Resident 5-day	Nonresident
[✓] Combination ($35)	[ ] Adult ($9)	[ ] Annual ($40)
[ ] Fishing ($18)	[ ] 12-15 yr. old ($4)	[ ] 5-day ($15)
[ ] under 16 yrs. old ($8)		[ ] 1-day ($5)
[ ] 65 & older ($9)		

3. Have any unlicensed children in your immediate family under 12 years old fished in Utah during the reporting period stamped above? (If more than one person in your family receives this questionnaire, please include the children on only one person's form.)

[ ] YES (Answer a through e below.)
[ ] NO (Skip to Question 4.)

a. How many unlicensed children fished during this period? [ ]

b. How many days did these children spend stream fishing in this reporting period (any part of a day counts as a day fished)? [ ]

c. How many days did these children spend lake and reservoir fishing in this reporting period (any part of a day counts as a day fished)? [ ]

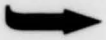
d. How many cold water fish (trout, kokanee, whitefish and cisco) were caught by these children in this reporting period? [ ]
How many of these fish were kept? [ ]

e. How many warm water fish (perch, bluegill, bass, catfish, walleye, pike, etc.) were caught by these children in this reporting period? [ ]
How many of these fish were kept? [ ]

4. Have you registered a boat in Utah during 1991?

[ ] YES (Continue with Questions. If you have reported this boat in previous questionnaires from this study, skip to Question 6.)
[-] NO (Please skip to Question 6.)

Questions 5 and 6



7. TRIP RECORD Please complete each item to the best of your recollection. If you can't remember details, just fill in as much as you can. Please circle the correct response where appropriate. Otherwise write in the requested information. **(All times and distances are one-way.)**

Trip No.	Date		Write in Site Name and indicate Lake or Reservoir (L), or River or Stream (S)		Did this trip start at your home? (Yes or No). If no, indicate miles from the point of origin (other than your home) to the site		Type of vehicle you used S=Sedan P2= Pickup, 2wd P4= Pickup, 4wd V=Van M=Motorcycle or ATV O=Other (Bicycle, etc.)	Travel time (one way to the nearest 1/4 hour)	No. of days on site (any part of a day counts as a full day)	Main Activ **F**= Fishing **FB**= Fishin **PB**= Powe or water sk **CA**= Camp **O**= Other (Circle one
	Mo.	Day		Site Name	Y/N	Miles				
1	6	5/16	LS	[illegible]	Y N	1	S P2 P4 V M O	1 1/2	2	F FB PB
2	7	29/30	LS	[illegible]	Y N		S P2 P4 V M O	2 hrs	5	F FB PB
3	7	28/29	LS	[illegible]	Y N		S P2 P4 V M O	1 1/2	2	F FB PB
4			LS		Y N		S P2 P4 V M O			F FB PB
5			LS		Y N		S P2 P4 V M O			F FB PB
6			LS		Y N		S P2 P4 V M O			F FB PB
7			LS		Y N		S P2 P4 V M O			F FB PB
8			LS		Y N		S P2 P4 V M O			F FB PB
9			LS		Y N		S P2 P4 V M O			F FB PB
10			LS		Y N		S P2 P4 V M O			F FB PB

5. What kind(s) of boat(s) did you register? (Circle responses where appropriate.)

Boat No.	Construc-tion	Length in feet	Type of drive	Horse-power	Year made	Year bought	Price paid	Type of boat
1	A G O		IB OB					F SK SA O
2	A G O		IB OB					F SK SA O
3	A G O		IB OB					F SK SA O

A = Aluminum or other metal
G = Fiberglass
O = Other (Wood, etc.)

IB = Inboard
OB = Outboard

F=Fishing (bass boat, jon boat)
SK=Ski or power boat
SA=Sailboat
O=Other

We have a Driver Dory that doesn't need to be registered. We write

6. Have you fished and/or boated in Utah during the reporting period stamped on the front page?

[✓] YES (Continue with the next question.)
[ ] NO (Thank you. You have completed the questionnaire for this reporting period.)

oat oat ng	Other Activities **F**= Fishing w/o boat **FB**= Fishing w/ boat **PB**= Power boating or water skiing **CA**= Camping **O**= Other (Circle all that apply)	No. of days fished (any part of a day counts as a full day)	If you fished, number of "KEEPER"* size cold water fish caught (even if released), and number of these fish kept	If you fished, number of "KEEPER"* size warm water fish caught (even if released), and number of these fish kept	Estimate YOUR non-vehicle expenses over "normal" at home costs for food, drink, etc. (include **boat** gas and oil)	Number of persons in party and number of families in party	Have you visited this site before? (Yes or No). If yes, about how many times in the past 5 years?	Rate your satisfaction with this trip (1 = not at all satisfied; 7 = completely satisfied)
			Caught / Kept	Caught / Kept		Persons / Families	Yes/No / # of visits	
O	F FB PB (CA) O	2	2 / 0	0 / 0	$25	4 / 2	Y (N)	1 2 3 4 5 6 7
O	F (FB) PB (CA) O	4	1 / 0	0 / 0	$150	5 / 2	(Y) N 4	1 2 3 4 5 6 7
O	F FB PB (CA) O	2	4 / 0	0 / 0	$100	2 / 2	(Y) N	1 2 3 4 5 6 7
O	F FB PB CA O		/	/		/	Y N	1 2 3 4 5 6 7
O	F FB PB CA O		/	/		/	Y N	1 2 3 4 5 6 7
O	F FB PB CA O		/	/		/	Y N	1 2 3 4 5 6 7
O	F FB PB CA O		/	/		/	Y N	1 2 3 4 5 6 7
O	F FB PB CA O		/	/		/	Y N	1 2 3 4 5 6 7
O	F FB PB CA O		/	/		/	Y N	1 2 3 4 5 6 7
O	F FB PB CA O		/	/		/	Y N	1 2 3 4 5 6 7

* A "KEEPER" fish is any fish that you feel is large enough to be worth keeping.

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Utah State University
Logan, Utah 84322-5215

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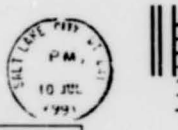

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UMC-5215
UTAH STATE UNIVERSITY
LOGAN UT 84321-9831

5. TRIP RECORD Please complete each item to the best of your recollection. If you can't remember details

Site name. Circle Lake or Reservoir (L) or River or Stream (S)	Number of trips to this site during the period from July 1 to December 31, 1990	Indicate Weekend (WE) or Weekdays (WD) or both (B)	Usual tow vehicle (from Question # 2 above)	Usual number of days on site. Any part of a day is count-ed as a day	Main activity (Usual) [Circle one] F=Fishing PB=Power boating or water skiing C=Camping O=Other	Other a [Circle as apply] F=Fishing PB=Power b water skiing C=Camping O=Other
(L) S Soldier Creek	4	WE	Yes	2	F	(F) (PB) (C)
(L) S Willard bay	6	B	Yes	1	PB	(F) PB C
(L) S Pineview	2	B	Yes	1	PB	(F) PB C
(L) S Electric	1	we	Yes	1	F	F PB C
(L) S Whitney	1	we	Yes	1	F	F PB C

PART II - FAMILY AND E

The following information will be held in strictest conf

6. Your sex (Circle the appropriate answer):
(1 MALE)
2 FEMALE

7. Your present age: 32 Years

8. Present marital status (circle the appropriate answer):
1 NEVER MARRIED
(2) MARRIED
3 DIVORCED
4 SEPARATED
5 WIDOWED

9. Are you self-employed (own your own business)? (Circle the appropriate answer):
1 YES
(2 NO)

10. Please describe your usual occupation (If retired, write "retired", if unemployed, write "unemployed"):
JOB TITLE Aircraft mechanic
KIND OF WORK F4 Fighters

11. Method of payment for your job:
Salaried _____ Hourly X

12. Number of wage or income earners living at home: 2

13. Please describe the family relationship (such as wife, son, etc.) and job(s) of the two most important income earners other than you in your household (if any).
WAGE OR INCOME EARNER 2 (Such as wife) Wife
JOB TITLE Telemarketer
KIND OF WORK Telemarketing

WAGE OR INCOME EARNER 3 [redacted]
JOB TITLE _____
KIND OF WORK _____

14. Please check the bracket of your total house
____ $0 - $9,999
____ $10,000 - $14,999
____ $15,000 - $19,999
____ $20,000 - $24,999
____ $25,000 - $29,999
X $30,000 -
____ $40,000 -
____ $50,000 -
____ $60,000 -
____ $75,000 O

15. Approximately what percentage do you yo

16. Number of persons in your family living at h if any).
OLDER THAN 18? 2
12 TO 18 1
UNDER 12 YEARS OF AGE 2

17. Please list equipment other than your boat boating trips, its approximate purchase cost to the year of manufacture:
(a) Boating gear other than boat or towing veh

i. Type _____ Cost When Pu
Year Manufactured ____ Purchas

ii. Type _____ Cost When Pu
Year Manufactured ____ Purchas

iii. Type _____ Cost When P
Year Manufactured ____ Purchas

(b) Fishing gear (fish locators, rods and reels,

i. Type Rod & reel Cost When Pu
Year Manufactured 30' Purchas

ii. Type Rod & reel Cost When Pu
Year Manufactured 30' Purchas

in as much as you can. Circle the correct response where appropriate. Otherwise write in the requested information.

ties as gor	If you fished, how many days did you fish per trip (Average)	Average time traveled to site (one-way, to near-est 1/4 hour)	Average time boating	Average number of people in party	Average number of families in party	Average non-vehicle expenses which **YOU** paid (over and above "normal" at home costs for food, drink, etc.) Include boat gas and oil (nearest $10)	Number of times visited this site in past 5 years	Usual satisfaction with trips (1= Not at all, 7=comp-letely) Circle the number which applies.
	F PB C O	3 hrs	8 hrs	4-6	1-2	100.00	15	1 2 3 4 (5) 6 7
	F PB C O	1 hr	4 hrs	5	1	120.00	10	1 2 3 (4) 5 6 7
	F PB C O	1 hr	4 hrs	5	1	40.00	6	1 2 3 4 (5) 6 7
	F PB C O	3 hrs	8 hrs	5	2	40.00	2	1 2 3 4 (5) 6 7
	F PB C O	5 hrs	8 hrs	10	3	40.00	1	1 2 3 4 (5) 6 7

PMENT CHARACTERISTICS

Your name will not be associated with the data collected.

ncome (FOR ALL PERSONS LIVING AT HOME) for 1990.
+)
+)
+)
+)
RE
arn of that income? 90 %
each age group (includi[illegible] yourself and your spouse.

towing vehicle(s) which you own and used on your earest $100), its age (in years) when purchased, and

ailer, water skis and skiing accessories, etc.

d_____ Age When Purchased ____
tah? Y N

d_____ Age When Purchased ____
tah? Y N

ed_____ Age When Purchased____
tah? Y N

d 30.00 Age When Purchased Age
tah? (Y) N

d 30.00 Age When Purchased Age
tah? (Y) N

iii. Type Rod & reel Cost When Purchased 30.00 Age When Purchased Age
Year Manufactured 20[illegible] Purchased in Utah? (Y) N

(c) Camping gear

i. Trailers/Camper Trailer Cost When Purchased 1000.00
Age When Purchased [illegible] 20 Yrs Year Manufactured 1956 Purchased in Utah? (Y) N

ii. Type _____ Cost When Purchased_____
Age When Purchased____ Year Manufactured_____ Purchased in Utah? Y N

iii. Type _____ Cost When Purchased_____
Age When Purchased____ Year Manufactured_____ Purchased in Utah? Y N

iv. Type _____ Cost When Purchased_____
Age When Purchased____ Year Manufactured_____ Purchased in Utah? Y N

If you have any comments which you would like to make, please write them in the space below, or include them on a separate sheet of paper. Thank you again for your cooperation.

College of Natural Resources
Utah State University
Logan, Utah 84322-5215

fold fold

fold fold

College of Natural Resources A147
Utah State University
Logan, Utah 84322-5215

Business
Reply
Permit #115

State-Wide Fishing and Boating Survey
College of Natural Resources, UMC 5215
Utah State University
Logan UT 84321-9831

I

1991 UTAH FISHERY MANAGEMENT AND BOATING SURVEY

INSTRUCTIONS Please respond to the questions that follow by circling the number or letter that best represents your answer or your opinion. If you have no opinion for a question, just write "DON'T KNOW" in the margin and go on to the next question.

1. Have you done any fishing in Utah during the past three years?

   (A) Yes (Please continue with SECTION I below)
   B. No (Please skip to SECTION II on page 6)

SECTION I: FISHING QUESTIONS AND CONCERNS

2. Overall, how many years have you been involved in fishing?

   A. One or two years
   B. Three to five years
   C. Six to ten years
   D. Eleven to fifteen years
   E. Sixteen to twenty years
   (F) Over twenty years

3. On average, about how many fishing trips do you make each year?

   A. One or two trips
   B. Three to five trips
   C. Six to ten trips
   (D) Eleven to fifteen trips
   E. Sixteen to twenty trips
   F. Over twenty trips

4. How would you evaluate your level of fishing skill, on a scale ranging from "Beginner" (1) to "Expert" (7)?

   BEGINNER 1 2 3 4 5 6 (7) EXPERT

5. Please indicate the percentage of your fishing time that is spent using each of the following techniques, by writing in a number between 0% and 100%. Your answers should total to 100%.

   A. Fishing with artificial flies 10 %
   B. Fishing with spinners or other artificial lures 60 %
   C. Fishing with bait 30 %
   D. Other methods (Please specify:_____) ___ %
   TOTAL = 100%

6. What are your views about the use of special regulations such as slot limits, catch and release regulations, and restricted creel limits on selected waters in Utah? Please answer on a scale ranging from 1, meaning you strongly oppose such special regulations, to 7, meaning you strongly support such regulations. A response of 4 would mean you have neutral views about the use of special regulations.

STRONGLY OPPOSE						STRONGLY SUPPORT
1	2	3	4	5	6	(7)

7. What are your views about the year-round fishing season which is currently in place for most fishing waters in Utah? Please answer on the same scale of 1 (strongly oppose) to 7 (strongly support).

STRONGLY OPPOSE						STRONGLY SUPPORT
1	2	3	4	5	6	(7)

8. What are your views about the use of some of the revenues generated from fishing license fees to enhance populations of nongame and endangered fish species (for example humpback chub, razorback sucker, Colorado squawfish, etc.) in Utah?

STRONGLY OPPOSE						STRONGLY SUPPORT
1	2	3	4	5	6	(7)

9. How satisfied are you with the current format of the Utah fishing proclamation? Please answer on a scale ranging from 1 (extremely dissatisfied) to 7 (extremely satisfied).

EXTREMELY SATISFIED						EXTREMELY DISSATISFIED
1	2	3	4	5	6	(7)

10. Are there any specific changes that you would like to see in the format of the proclamation?

_____

_____

11. Would you say that during the last year or two you have spent more time fishing than you have in previous years, spent less time fishing, or spent about the same amount of time fishing as you have in previous years?

A. Spent more time fishing (Please answer QUESTION 12)
(B.) Spent about the same time fishing (Skip to QUESTION 13)
C. Spent less time fishing (Please answer QUESTION 12)

12. If you are spending more or less time fishing than you have in previous years, why is that the case?

_____

_____

13. Please think about how important fishing is to you, in comparison to other interests and activities in your life. We'd like you to respond on a scale ranging from 1, meaning that fishing is <u>not at all important</u> to you, to 7, meaning fishing is <u>extremely important</u> to you. Please circle the number that best represents how important fishing is to you.

NOT AT ALL IMPORTANT						EXTREMELY IMPORTANT
1	2	3	4	5	6	(7)

14. Please consider your overall fishing experiences in Utah during the past three years. On a scale that ranges from 1, meaning that your experiences have been <u>extremely poor</u> overall, up to 7, meaning your experiences have been <u>extremely good</u> overall, what number best describes your fishing experiences in the state?

EXTREMELY POOR						EXTREMELY GOOD
1	(2)	3	4	5	6	7

15. Why do you feel that way? Utah has a poor catch records - the only fish that are caught are 8 to 10" fresh plants - fishing needs better management ie. Catch & release closer watch on poaching ect. to provide larger fish - Also we need other fisheries for fish other than trout - walleye are one of the better fish on this cont. but are not developed in Utah.

16. On a scale ranging from 1, meaning <u>extremely dissatisfied</u>, to 7, meaning <u>extremely satisfied</u>, how satisfied are you with the <u>number</u> of fish that you tend to catch while fishing in Utah?

EXTREMELY DISSATISFIED						EXTREMELY SATISFIED
1	(2)	3	4	5	6	7

17. On this same 1 to 7 scale, how satisfied are you with the <u>size</u> of the fish that you tend to catch while fishing in Utah?

EXTREMELY DISSATISFIED						EXTREMELY SATISFIED
(1)	2	3	4	5	6	7

18. Now, we'd like to ask some questions about the kind of satisfaction you might get from fishing. On a scale that ranges from 1, meaning no satisfaction at all, up to 7, meaning an extremely high degree of satisfaction, how much satisfaction does each of the following provide as part of your fishing experiences?

		NO SATISFACTION						EXTREME SATISFACTION
A.	Getting your limit of fish	1	2	3	4	5	6	(7)
B.	Talking with other anglers	1	2	3	4	5	6	(7)
C.	Seeing other anglers	1	2	(3)	4	5	6	7
D.	Catching a very large fish	1	2	3	4	5	6	(7)
E.	Bringing fish home to eat	1	2	(3)	4	5	6	7
F.	Catching at least one or two fish	1	2	3	4	5	6	(7)
G.	Releasing small fish that you catch	1	2	3	4	5	6	(7)
H.	Releasing large fish that you catch	1	2	3	4	5	6	(7)
I.	Spending time with family or friends	1	2	3	4	5	6	(7)
J.	Improving your fishing skills and abilities	1	2	3	4	5	6	(7)
K.	Getting away from people	1	2	3	4	5	6	(7)
L.	Enjoying nature and the outdoors	1	2	3	4	5	6	(7)
M.	Having a chance to relax and unwind	1	2	3	4	5	6	(7)
N.	Teaching fishing skills to someone else	1	2	3	4	5	6	(7)
O.	Maintaining a family tradition of fishing	1	2	3	4	5	6	(7)

19. Each angler has different preferences for the kinds of fish he or she fishes for. The following species are among those found in Utah's public fishing waters. Please indicate how much you desire to catch each species by circling the appropriate number, on a scale ranging from 1 (extremely undesirable) to 7 (extremely desirable). A value of 4 would mean that you have a neutral view about the desirability of catching a particular species.

		EXTREMELY UNDESIRABLE						EXTREMELY DESIRABLE
A.	Channel catfish	1	2	3	4	5	6	(7)
B.	Mackinaw (lake) trout	1	2	3	(4)	5	6	7
C.	Kokanee salmon	1	2	3	4	5	6	(7)
D.	Largemouth bass	1	2	3	4	5	(6)	7
E.	Smallmouth bass	1	2	3	4	(5)	6	7
F.	Green sunfish	1	2	3	4	(5)	6	7
G.	Brown trout	1	2	3	4	5	6	(7)
H.	Walleye	1	2	3	4	5	6	(7)
I.	Chub	(1)	2	3	4	5	6	7
J.	Rainbow trout	1	2	3	4	5	6	(7)
K.	White bass	1	2	3	4	(5)	6	7
L.	Whitefish	1	2	3	4	5	6	(7)
M.	Bluegill	1	2	3	4	5	6	(7)
N.	Cutthroat trout	1	2	3	4	5	6	(7)
O.	Other (Specify) ————	1	2	3	4	5	6	7
P.	Other (Specify) ————	1	2	3	4	5	6	7

20. Look at the two photos below. Suppose the responsible management agencies were able to limit access to a site in your area to reduce the number of anglers on the most crowded day from something like Photo A to Photo B.

Photo A

Photo B

20a. Would you be willing to pay an annual entry fee (in addition to any current fee) of $25.00 to have access to this area?

A. Yes (Go to QUESTION 21)
(B) No (Answer QUESTION 20b below)

20b. If you answered "No", is it because:

A. It would not be worth it to you.
B. You do not think an entry fee should be charged.
C. Other (Specify) I would have to know more about the rules of the game and to what extent the extra fee would increase the fish; if it was attractive and decent fish could be caught I would be willing to pay the extra fee.

21. Would you be willing to make a check-off contribution of $25.00 on your state tax form if the funds were used to enhance populations of nongame and endangered fish species in Utah?

(A) Yes (Go to QUESTION 22)
B. No (Answer QUESTION 21a below)

21a. If you answered "No", is it because:

A. It would not be worth it to you.
B. You do not think a contribution should be necessary.
C. Other (Please specify) _____

_____

22. Suppose the Division of Wildlife Resources could develop a trophy fishery in your area (either warm or cold water species), with limits on size and number of fish kept and restrictions on lure types.

22a. Would you be willing to pay an annual fee of $50.00 to have access to such a fishery?

(A) Yes (Go to QUESTION 23)
B. No (Answer QUESTION 22b below)

22b. If you answered "No", is it because:

A. It would not be worth it to you.
B. We already have too many areas with catch and lure restrictions.
C. You do not think an entry fee should be charged.
D. Other (Specify) _____

_____

23. Suppose the Division of Wildlife Resources could develop an extensive fish hatchery system that would provide large scale put-and-take planted fisheries in your area.

23a. Would you be willing to make a check-off contribution of $10.00 on your state tax form to fund such a program?

(A) Yes (Go to QUESTION 24)
B. No (Answer QUESTION 23b below)

23b. If you answered "No", is it because:

A. It would not be worth it to you.
B. You do not think a contribution should be necessary.
C. There are already enough hatcheries in the state.
D. You don't like planted fisheries.
E. Other (Specify) _____

_____

SECTION II: BOATING QUESTIONS AND CONCERNS

24. Have you done any boating in Utah during the past three years?

(A) Yes (Please continue)
B. No (Please skip to SECTION III on page 10)

25. In the space below, write the name of the Utah lake or reservoir you use most frequently. (Circle "None" if you do not boat on Utah reservoirs or lakes)

A. Strawberry Res. (Please continue)
B. None (Please skip to SECTION III on page 10)

26. How satisfied are you with the adequacy of boat launching ramps and facilities at the Utah lake or reservoir you use most frequently? Please answer on a scale ranging from 1 (extremely dissatisfied) to 7 (extremely satisfied).

EXTREMELY DISSATISFIED 1 2 3 4 5 6 (7) EXTREMELY SATISFIED

27. What specific improvements to launching ramps and other facilities would you like to see at the Utah lake or reservoir you use most frequently?

I think the facilities at Strawberry have been improved to excellent in the past 10 years—

28. Are there any Utah lakes or reservoirs that do not now have developed launching facilities which you feel need them? Please list up to three sites, starting with the one that you feel needs such facilities the most.

1._____ 2._____ 3._____

The following questions describe possible boating opportunities which may or may not occur. Your responses to these questions will help the Division of Wildlife Resources and the Division of Water Resources to better manage Utah's streams and reservoirs. While some of the questions are complex, we ask that you consider them seriously and respond with the decisions which you would make if you faced the situations described in each question.

29. Suppose the Division of Water Resources could limit the drawdown on the site which you mentioned in QUESTION 25 so that there was no interference with your access (that is, boat ramps would never be completely uncovered, docking and marina areas would always be usable, shorelines would be accessible, etc.)

29a. Would you be willing to pay an annual entry fee (in addition to any current fee) of $100.00 to assure this type of operation?

A. Yes (Please skip to QUESTION 30)
(B.) No (Please answer QUESTION 29b below)

29b. If you answered "No," is it because:

A. It would not be worth it to you.
(B.) You do not think an entry fee should be charged.
C. Other (Specify) _____

_____

30. Look at the two photographs below. Suppose the Division of Parks and Recreation were able to limit access to the site you mentioned in QUESTION 25 so that the heaviest use day changed from something like Photo A to something like Photo B.

Photo A

Photo B

30a. Would you be willing to pay an annual entry fee (in addition to any current fee) of $50.00 to assure this reduction in use?

A. Yes (Please skip to QUESTION 31)
(B.) No (Please answer QUESTION 30b below)

30b. If you answered "No", is it because

A. It would not be worth it to you.
B. You do not think an entry fee should be charged.
C. Other (Specify) Strawberry is mainly a fish lake
Very seldom do you see water skiers

31. Suppose a new reservoir was constructed in your area. This reservoir would be about 1500 surface acres (about 1 mile wide by 2 miles long). It would have a similar quality of water, operation and drawdown, and fishing quality as the site you listed in QUESTION 25.

31a. Would you be willing to drive 25 miles (one way) to this site?

(A) Yes (Please skip to QUESTION 31d below)
B. No (Please answer QUESTION 31b)

31b. If you would not visit the new reservoir, is it because:

A. It would not be worth it to you to drive that far.
B. There are enough reservoirs and lakes for you to use already.
C. You object to the construction of any more reservoirs.
D. Other (Specify) _____

_____

31c. If you answered question 31b, please skip to QUESTION 32

31d. If you answered "Yes", about how many times would you visit this new site each year? 10-15 times

31e. Would you reduce the number of times which you visited other sites?

(A) Yes (Please answer QUESTION 31f)
B. No (Please skip to QUESTION 31g below)

31f. If you answered "Yes", about how many fewer times would you visit other sites per year? 5 or 6 times

31g. If this site were constructed at the distance from you indicated in QUESTION 31a above, would you be willing to pay an annual entry fee of $25.00?

(A) Yes (Please skip to QUESTION 32 below)
B. No (Please answer QUESTION 31h)

31h. If you answered "No", was it because:

A. It would not be worth it to you.
B. You do not think an entry fee should be charged.
C. Other (Specify) _____

_____

SECTION III: FISHING AND BOATING EQUIPMENT

32. What kinds of towing vehicles do you use for the boat(s) you use on Utah lakes or reservoirs? (Please circle or write in the appropriate answer for columns 2 through 7) Skip to QUESTION 32a if you do not tow your boat(s).

(1) (2) (3) (4) (5) (6) (7)

Vehicle No.	Body Type*	Engine Type (Cylinders)	Drive Type (__-Wheel Drive)	Year Made	Year Bought	Approximate Cost When Bought
1	S PU V	4 6 8	2 4			
2	S PU V	4 6 8	2 4			
3	S PU V	4 6 8	2 4			

* S = Sedan; PU = Pickup or truck; V = van, minivan, or station wagon.

32a. If you do not tow your boat from your home to the boating site for each trip, what facility do you use for your boat storage between uses?

A. Dock or slip
B. Dry storage
C. Other (Please specify) I rent boats or go with friends

32b. What is the cost of this storage for the season (nearest $10)? _____

33. Please estimate the current total value of the equipment you use for fishing and boating trips (do not include your boat, motor, or towing vehicle).

A. less than $500
B. $500 to $999
C. $1,000 to $2,499
(D.) $2,500 to $4,999
E. $5,000 to $7,499
F. $7,500 to $9,999
G. $10,000 to $20,000
H. over $20,000

SECTION IV: BACKGROUND INFORMATION

The following information will be used only to provide a statistical description of our sample. All responses will remain entirely anonymous.

34. What is your sex? (Circle the appropriate letter)

(A) Male
B. Female

35. What is your present age? 48 Years

36. What is your present marital status?

A. Never married
(B.) Married
C. Divorced
D. Separated
E. Widowed

37. How many persons are currently living in your household in each of the following age groups? (Include yourself and your spouse, if any)

____ persons under the age of 12
____ persons ages 12 to 18
3 persons older than 18 years of age

38. Are you self-employed/own your own business?

A. Yes
(B.) No

39. Please describe your usual occupation. (If retired, write "retired", if unemployed, write "unemployed")

Job Title: Plant Manager

Type of Work: Oil tool service

40. How many income earners currently live in your household? 2

41. Please circle one response that best indicates your total annual household income before taxes for this year. (Include the income of all persons living at home)

A. $0-$9,999
B. $10,000-$19,999
C. $20,000-$29,999
D. $30,000-$39,999
E. $40,000-$49,999
F. $50,000-$59,999
G. $60,000-$69,999
(H.) $70,000 or more

42. Approximately what percentage do YOU earn of that income? 80 %

You have now completed the questionnaire. Please close the survey booklet, tape or staple it closed, and drop it in the mail. The postage is already paid. If you have any comments which you would like to make, please write them in the space that follows, or include them on a separate sheet of paper.

THANK YOU FOR YOUR HELP

UTAH
BOATING AND
FISHING SURVEY II

The following questions describe possible boating or fishing opportunities which may or may not occur. Your responses to these questions will help the Department of Natural Resources to better manage Utah's streams and reservoirs. While some of the questions are complex, we ask you to consider them seriously and respond with the decisions which you would make if you faced the situations described in each question. Thank you for your time and effort.

SECTION I

1. Which Utah lake or reservoir do you use most frequently?
   Write the name of the lake or reservoir below or NONE if you do not boat or fish at Utah reservoirs or lakes.
   If you write NONE, go to Question 2. If you specify a reservoir or lake, go to SECTION II.)

   KOLOB RESERVOIR

2. If you listed NONE, do you boat on lakes or reservoirs in other States?

   _____ Yes (Go to Question number 3)

   _____ No (You have completed this questionnaire. Please fold it so that the Utah State University address is on the outside, tape or staple it closed, and drop it in the mail. The postage is already paid. Thank you.)

3. Specify which lake or reservoir you use most frequently, and the state in which it is found.

   _____

SECTION II

Suppose a new reservoir was constructed in your area. This reservoir would be about 1500 surface acres (about 1 mile wide by 2 miles long). It would have a similar quality of water, operation and drawdown, and fishing quality as the site you listed in SECTION I.

1. Would you be willing to drive 100 miles (one way) to this site?
   X Yes (Go to the next question)
   ___ No (Go to question number 6 below)

2. If you answered yes, about how many times would you visit this new site each year? 2 or 3

3. Would you reduce the number of times which you visited other sites?
   X Yes
   ___ No
   If you answered yes, about how many fewer times would you visit other sites per year? 2 or 3

4. If this site were constructed at the distance from you indicated in Question 1, would you be willing to pay an annual entry fee of $40.00?
   ___ Yes (Go to SECTION III on the next page)
   X No (Continue to the next question)

5. If you answered "no," was it because:
   X It would not be worth it to you.
   ___ You do not think an entry fee should be charged.
   ___ Other (Specify) _____
   _____

   NOW GO TO SECTION III.

6. If you would not visit the new reservoir, is it because:
   ___ It would not be worth it to you to drive that far.
   ___ There are enough reservoirs and lakes for me to use already.
   ___ I object to the construction of any more reservoirs.
   ___ Other (Specify) _____
   _____

SECTION III

Suppose the Division of Water Resources could limit the drawdown on the site which you mentioned in SECTION I so that there was no interference with your access (that is, boat ramps would never be completely uncovered, docking and marina areas would always be usable, shorelines would be accessible, etc.)

1. Would you be willing to pay an annual entry fee (in addition toany current fee) of $40.00 to assure this type of operation?

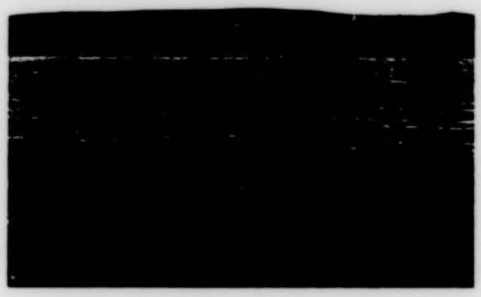
___ Yes
X No

2. If you answered No, is it because:

X It would not be worth it to you.
___ I do not think an entry fee should be charged.
___ Other (Specify) _____

SECTION IV

Look at the two photographs below. Suppose the Division of Parks and Recreation were able to limit access to the site you mentioned in SECTION I so that the heaviest use day changed from something like Photo A to something like Photo B.



1. Would you be willing to pay an annual entry fee (in addition to any current fee) of $40.00 to assure this reduction in use?

___ Yes
X No

I AM RETIRED AND ONLY FISH IT'S A SMALL 14' FT BOAT. THESE QUISTIONS SOUND LIKE YOU WONT TO MAKE FISHING ONLY FOR THE RICH

2. If you answered No, is it because:

X It would not be worth it to you.
___ I do not think an entry fee should be charged.
___ Other (Specify) _____

You have now completed the questionnaire. Please fold it so that the Utah State University address is on the outside, tape or staple it closed, and drop it in the mail. The postage is already paid. Thank you again for your help.

College of Natural Resources
Utah State University
Logan, Utah 84322-5215

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