OUTDOOR RECREATION USE AND VALUE:
SNAKE RIVER BASIN OF CENTRAL IDAHO

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EXECUTIVE SUMMARY

Two surveys were conducted on recreationists in the Snake River Basin in central Idaho for the purposes of: (1) measuring willingness-to-pay for recreation trips and, (2) measuring expenditures by recreationists. The surveys were conducted by a single mailing using a list of names and addresses collected from recreationists in the Snake River Basin and surveys distributed by guides during April 15, 1998 through November 30, 1998. The recreation demand survey resulted in 190 usable responses. In comparison to the Lower Snake River Reservoir surveys and the Upstream of Lewiston surveys, the central Idaho survey was hindered by a lack of central sites where recreationists could be contacted by clerks to obtain the names and addresses of those willing to participate in the survey. The inclusion of a two dollar bill as an incentive payment also was not allowed for the central Idaho surveys but was used in the prior surveys. One result was that a much larger share of the returned surveys were incomplete. About 34 percent of the returned surveys were missing critical information and could not be used for the demand analysis although they were useful to estimate averages. The response rate for the travel cost questionnaire was not measurable because of the diverse methods used to distribute surveys.

The recreation demand analysis used a model that assumed persons did not (or could not) give up earnings in exchange for more free time for outdoor recreation. This model requires extensive data on recreationists' time and money constraints, time and money spent traveling to the river recreation sites, and time and money spent during the recreation trip for a variety of possible activities. The travel cost demand model related recreation trips (from home to site) per year by groups of recreationists (average about 2.76 trips per year based on a sample of 190 anglers) to the dollar costs of the trip, to the time costs of the trip, to the prices on substitute or complementary trip activities, and other independent variables. The dollar cost of the trip was based on reported travel distances from home to site times the cost per person of 7.6 cents per mile.

The primary objective of the demand analysis was to estimate willingness-to-pay per trip for recreation in the Snake River Basin in central Idaho. Consumer surplus (the amount by which total consumer willingness-to-pay exceeds the costs of production) was estimated at $87.24 per person per travel cost trip. The average number of recreation trips per year from home to the Snake River Basin in central Idaho was 2.76 (sample of 288 recreationists) resulting in an average annual willingness-to-pay of $241 per year per recreationist. The total annual willingness-to-pay for all recreationists in the Snake River Basin of central Idaho is estimated at $25.1 million (see pages 31-32).

The recreation "demand" survey provided detailed information on samples of individuals who recreated in the Snake River Basin in central Idaho. The information provided by these samples was used to infer the spending behavior of recreationists in the Snake River Basin in central Idaho. In capsule, the data collected by the demand survey provided information that was used to estimate the "willingness-to-pay" (marginal benefits) by consumers for various amounts of outdoor recreation.

Estimation of the marginal benefits (demand) function allowed calculation of “net economic value” per recreation trip.

The outdoor recreationist spending survey showed spending patterns useful in estimating the stimulus to jobs and business sales in the region created by recreationists attracted to the Snake River Basin in central Idaho. The surveys also provided information on transportation, lodging, and outdoor recreation activities enjoyed by recreationists.

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MEASUREMENT OF ECONOMIC VALUE

A public good like the Snake River Basin differs in two significant ways from a competitive firm. First, the public good is very large relative to the market that it serves; this is one of the reasons that a government agency is involved. Because of the size of the project, as output (recreation access) is restricted the price that people are willing to pay will increase (a movement up the market demand curve). Price is no longer at a fixed level as faced by a small competitive firm. Second, the seller (government) does not act like a private firm which charges a profit-maximizing price. A public project has no equilibrium market price that can easily be observed to indicate value or, i.e., marginal benefit.

If output for recreation in the Snake River Basin in central Idaho was supplied by many competitive firms, market equilibrium would occur where the declining market demand curve intersected the rising market supply curve.[1] A competitive market price would indicate the marginal benefit to consumers of an added unit of outdoor recreation. However, calculation of total economic value produced would require knowledge of the market demand because many consumers would be willing-to-pay more than the equilibrium price. The amount by which total consumer willingness-to-pay exceeds the costs of production is the total net benefit or "consumers surplus." If output was supplied by many competitive firms, statistical estimation of a market demand curve could use observed market quantities and prices over time.

Economic value (consumers surplus) of a particular output (outdoor recreation) of a public good also can be found by estimating the consumer demand curve for that output. The economic value of recreation in the Snake River Basin in central Idaho can be determined if a statistical demand function showing consumer willingness-to-pay for various amounts of recreation is estimated. Because market prices cannot be observed, (recreation is a non-market good), a *surrogate price* must be used to model consumer behavior toward outdoor recreation (U.S. Army Corps of Engineers 1995; Herfindahl and Kneese 1974; McKean and Walsh 1986; Peterson et al. 1992).

The recreation demand survey collected information on individuals at the river showing their number of recreation trips per year and their cost of traveling to the recreation site. The price faced by recreationists is the cost of access to the recreation site (mainly the time and money costs of travel from home to site), and the quantity demanded per year is the number of recreation trips they make to the Snake River Basin. A demand relationship will show that fewer trips to the river are made by people who face a larger travel cost to reach the river from their homes (Clawson and Knetsch 1966). " The Travel cost method (TCM) has been preferred by most economists, as it is based on observed market behavior of a cross-section of users in response to direct out-of-pocket and time cost of travel."

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[1] The competitive market equilibrium is economically "efficient" because total consumer benefits are maximized where marginal cost equals marginal benefits. If marginal costs exceed marginal benefits in a given market "rational" consumers will divert their spending to other markets.

(Loomis 1997)[2] "The basic premise of the travel cost method (TCM) is that per capita use of a recreation site will decrease if the out-of-pocket and time costs of traveling from place of origin to the site increase, other things remaining equal." (Water Resources Council 1983, Appendix 1 to Section VIII).

Figure 1 shows a market for outdoor recreation. (It is a convention to show price on the vertical axis and quantity demanded on the horizontal axis). A market supply and demand graph for outdoor recreation shows the economic factors affecting all recreationists in a region. The demand by persons for recreation trips is negatively sloped, showing that if the money cost of a recreation trip (round trip from home to site and back) rises, recreationists will take fewer trips per year. Examples of how money trip costs might rise include: increased automobile fuel prices, recreation regulators close nearby sites requiring longer trips to reach other sites, entrance fees are increased, boat launching fees are raised, or nearby sites become congested requiring longer trips to obtain the same quality outdoor recreation. The supply of recreation opportunities is upward sloping. The upward slope of recreation supply is caused by the need to travel ever further from home to obtain quality recreation if more people enter the "regional outdoor recreation market". Increased recreation trips in the region can occur when a larger percentage of the population becomes interested in recreation, when more non-local recreationists travel to the region to obtain quality recreation, or if the local population expands over time. The market demand/supply graph is useful for describing the aggregate economic relationships affecting recreationist behavior but a "site-demand" model is used to place a value on a specific recreation site.

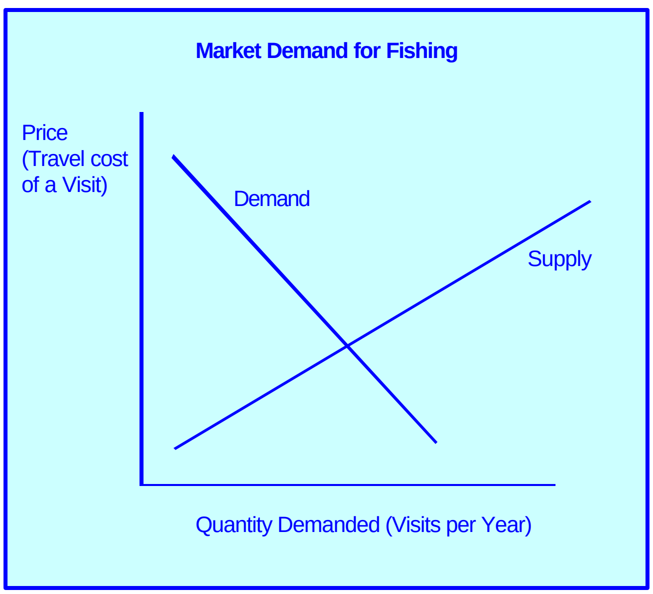

Figure 1 - Market demand for fishing

Figure 2 describes the demand by a typical recreationist for outdoor recreation in the Snake River Basin in central Idaho. Recreation demand is negatively sloped

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[2]Travel cost models are incapable of predicting contingent behavior and involve current users. Another set of economic models, contingent behavior and contingent value models, are typically used for projecting behavior or measuring non-use demand.

indicating, as before, that a higher cost or price to visit the recreation site will reduce recreation visits per year. The supply curve for a given person to visit a given site is horizontal because the distance from home to site, which determines the cost of access, is fixed. The supply curve would shift up if auto fuel prices increased but it would still be horizontal because the number of trips from home to recreation site per year would not influence the cost per trip.

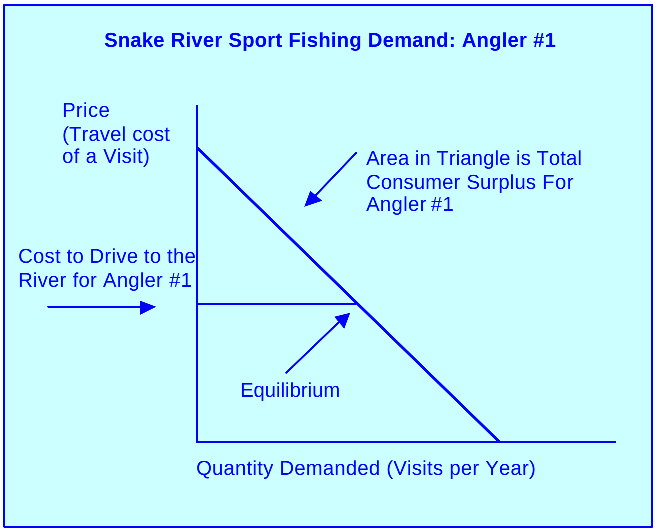

Figure 2 - Recreation demand for an individual

The vertical distance between the recreationist's demand for recreation and the horizontal supply (cost) of a recreation trip is the net benefit or consumer surplus obtained from a recreation trip. The demand curve shows what the recreationist would be willing-to-pay for various amounts of recreation trips and the horizontal line is their actual cost of a trip. As more recreation trips per year are taken, the benefits per trip decline until the marginal benefit (added satisfaction to the consumer) from an additional trip equals its cost where cost and demand intersect. The recreationist does not make any more visits to the river because the money value to this recreationist of the added satisfaction from another recreation trip is less than the trip cost. The equilibrium number of visits per year chosen by the recreationist is at the intersection of the demand curve and the horizontal travel cost line.

Each recreationist has a unique demand curve reflecting how much satisfaction they gain from recreating at the river, their free time available for outdoor recreation, the distance to alternate comparable recreation sites, and other factors that determine their likes and dislikes. Each recreationist also has a unique horizontal supply curve; at a level determined by the distance from their home to the recreation site of their choice, the fuel efficiency of their vehicle, access fees (if any), etc.

The critical exogenous variable in the travel cost model is the cost of travel from home to the recreation site. Each recreationist has a different travel cost (price) for a recreation trip from home to the river. Variation among recreationists in travel cost from home to recreation site (i.e., price variation) creates the Snake River Basin site-demand data shown in Figure 5. The statistical demand curve is fitted to the data in Figure 5 using regression analysis.[3] Nonmonetary factors, such as available free time and relative enjoyment for outdoor recreation, will also affect the number of river visits per year. The statistical demand curve should incorporate all the factors which affect the publics' willingness-to-pay for recreation at the river. It is the task of the Snake River Basin recreation survey to include

[3] It is possible that some anglers might select a residence location close to the reservoirs to minimize cost of travel (Parsons 1991). The travel cost model assumes that this doesn't happen. If anglers locate their residence to minimize distance to the reservoir fishing site then the assumption that travel cost is exogenous is invalid and a simultaneous equation estimation technique would be required.

questions that elicit information about persons that explains their unique willingness-to-pay for outdoor recreation.

The goal of the travel cost demand analysis is to empirically measure the triangular area in Figure 2 which is the annual net dollar value of satisfaction received or recreationist willingness-to-pay in excess of the costs of the recreation trips. The triangular area is summed for the 190 recreationists used in our statistical model and divided by their average number of trips per year (which, for 288 recreationists in our sample was 2.76 trips per year). This is the estimated consumer surplus per recreation trip or, i.e., net economic value per trip. The estimated average net economic value per trip (consumer surplus per trip), derived from the travel cost model, can be multiplied times the total recreation trips from home to the river in a year to find annual net benefits of the Snake River Basin in central Idaho for outdoor recreation.

Figure 5 shows unadjusted sample data relating recreation trips from home to site per year and dollars of travel expense per trip at the river for 288 respondents. (Only 190 of the 288 returned surveys contained adequate information to use in the statistical estimation of recreation demand.) Figure 6 shows the sample data relating recreation trips per year to the hours required to travel between home and the river recreation site. The data shown in both graphs reveal an inverse relationship between money or time required for a recreation trip to the river and trips demanded per year. Both out-of-pocket cost per trip and hours per trip act as prices for a recreation trip. Even before adjustment for differences among persons' available free time, recreation experience, and other factors affecting recreationist behavior, it is clearly shown by Figures 5 and 6 that persons with high travel costs or high travel time per trip take fewer recreation trips per year. Therefore, observations across the sample of 190 recreationists can reveal a recreation demand relationship.

In summary, each price level along a down-sloping demand curve shows the marginal benefit or recreationist willingness-to-pay for that corresponding output level (number of recreation trips consumed). The gross economic value (total willingness-to-pay) of the recreation output of a public good is shown by the area under the statistical demand function. The annual net economic value (consumer surplus) of recreation is found by subtracting the sum of the participants access (travel) costs from the sum of their benefit estimates. This is equivalent to summing the consumer surplus triangles for all recreationists at the river.

Recreation Demand Methods

Recreation Demand Survey

The mail surveys were distributed using names and addresses collected from recreationists by clerks in central Idaho or reported by guides in the Snake River Basin in Central Idaho. Figures 3 and 4 locate the study region in central Idaho.

Persons were contacted at recreation sites over the period from April 15, 1998 through November 30, 1998 and requested to take part in either the recreation demand or recreation spending mail surveys. Most persons contacted on-site were agreeable to receiving a mail questionnaire and provided their name and mailing address. Persons on guided tours or guided rafting trips were not directly accessible and tour guides mailed or handed out surveys to their clients.

The Snake River Basin recreation demand survey included detailed socio-economic information about recreationists and data on money and physical time costs of travel, recreation, and other activities both on and off river recreation sites. The questionnaire used for the mail survey is shown in Appendix II and is similar to the recreation and sportfishing questionnaires used on the lower Snake River reservoirs (Normandeau Associates et al. 1998b) and on the free flowing Snake River above Lewiston (Normandeau Associates et al. 1998d). The questionnaire used in this study is also similar to those used previously to study sportfishing demand on the Cache la Poudre River in northern Colorado and for Blue Mesa Reservoir in southern Colorado (Johnson 1989; McKean et al. 1995; McKean et al. 1996). Both of the latter surveys were by personal interview while the Snake River Basin survey was by mail.[4] The demand survey resulted in 190 completely useable responses.

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[4] The personal interview surveys had sample sizes of 200 and 150 while this survey had 190 useable responses. Sample size has varied widely in published water-based recreation studies. Ward (1989) used a sample of 60 mail surveys to estimate multi-site demand for water recreation on four reservoirs in New Mexico; Whitehead (1991-92) used a personal interview sample of 47 boat anglers for his fishing demand study on the Tar-Pamlico River in North Carolina; Laymen, et al. (1996) used a sample of 343 mail surveys to estimate angler demand for chinook salmon in Alaska.

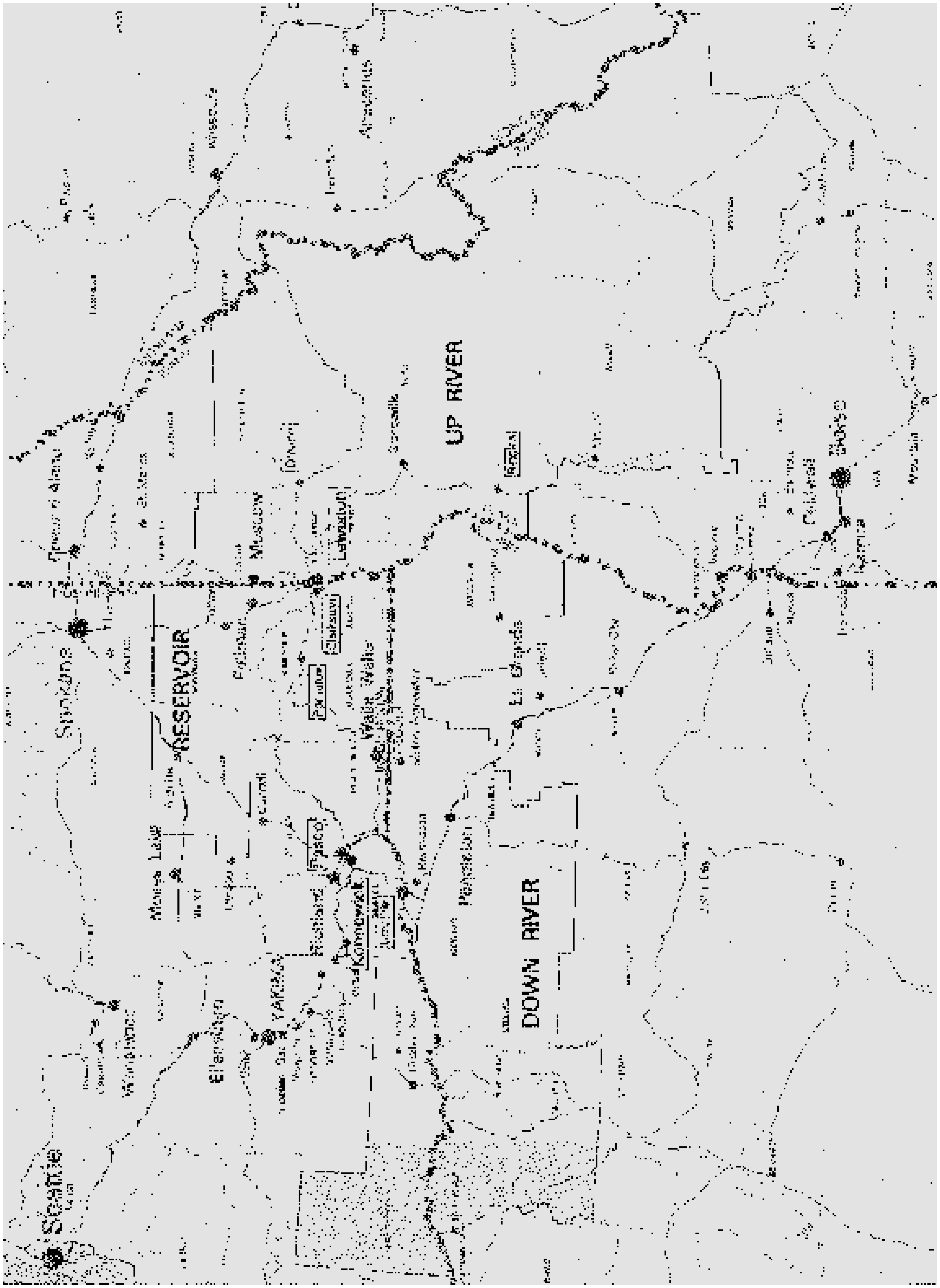

Figure 3 - The three subregions

Travel Time Valuation

There has been disagreement among practitioners in the design of the travel cost model, thus wide variations in estimated values have occurred (Parsons 1991). Researchers have come to realize that nonmarket values measured by the traditional travel cost model are flawed. In most applications, the opportunity time cost of travel has been assumed to be a proportion of money income based on the equilibrium labor market assumption. Disagreements among practitioners have existed on the “correct” income proportion and thus wide variations in estimated values have occurred.

The conventional travel cost models assume labor market equilibrium (Becker 1965) so that the opportunity cost of time used in travel is given by the wage rate (see a following section). However, much dissatisfaction has been expressed over measurement and modeling of opportunity time values. McConnell and Strand (1981) conclude, "The opportunity cost of time is determined by an exceedingly complex array of institutional, social, and economic relationships, and yet its value is crucial in the choice of the types and quantities of recreational experiences." The opportunity time value methodology has been criticized and modified by Bishop and Heberlein (1979), Wilman (1980), McConnell and Strand (1981), Ward (1983, 1984), Johnson (1983), Wilman and Pauls (1987), Bockstael et al. (1987), Walsh et al., (1989), Walsh et al. (1990a), Shaw (1992), Larson (1993), and McKean et al. (1995, 1996).

The consensus is that the opportunity time cost component of travel cost has been its weakest part, both empirically and theoretically. “Site values may vary fourfold, depending on the value of time.” (Fletcher et al. 1990). “... the cost of travel time remains an empirical mystery.” (Randall 1994).

Disequilibrium in labor markets may render wage rates irrelevant as a measure of opportunity time cost for many recreationists. For example, Bockstael et al. (1987) found a money/time tradeoff of \$60/hour for individuals with fixed work hours and only \$17/hour with flexible work hours.

The results from our previous studies and this study on the Snake River Basin in central Idaho suggest using a model specifically designed to help overcome disagreements and criticisms of the opportunity time value component of travel cost. We use a model that eliminates the difficult-to-measure marginal value of income from the time cost value. Instead of attempting to estimate a “money value of time” for each individual in the sample we simply enter the actual time required for travel to the recreation site as first suggested by Brown and Nawas (1973), and Gum and Martin (1975) and applied by Ward (1983,1989). The annual income variable is retained as an income constraint. An added advantage of not using income to measure opportunity time value is that colinearity between the time value component of travel cost and the income constraint should be greatly reduced.

Disequilibrium Labor Market Model

The travel cost model used in this statistical analysis assumes that site visits are priced by both (1) out-of-pocket travel expenses, and (2) opportunity time costs of travel to and from the site. Opportunity time cost has been conventionally defined in economic models as money income foregone (Becker 1965; Water Resources Council 1983). However, a person’s consideration of their limited time resources may outweigh money income foregone given labor market disequilibrium and institutional considerations. Persons who actually could substitute time for money income at the margin represent a small part of the population, especially the population of recreationists. Retirees, students, and unemployed persons do not exchange time for income at the margin. Many workers are not allowed by their employment contracts to make this exchange. Weekends and paid vacations of prescribed length are often the norm. Thus, the equilibrium labor market model may apply to certain self-employed persons, e.g., dentists or high level sales occupations, where individuals, (1) have discretionary work schedules and, (2) can expect that their earnings will decline in proportion to the time spent recreating. (Many professionals can take time off without foregoing any income). The equilibrium labor market subgroup of the population is very small. According to U.S. Bureau of Labor Statistics and National Election Studies (U.S. Bureau of the Census 1993), only 5.4 percent of voting age persons in the U.S. were classified as self-employed in the United States in 1992. The labor market equilibrium model applies to less than 5.4 percent of recreationists who are over-represented by retirees and students.

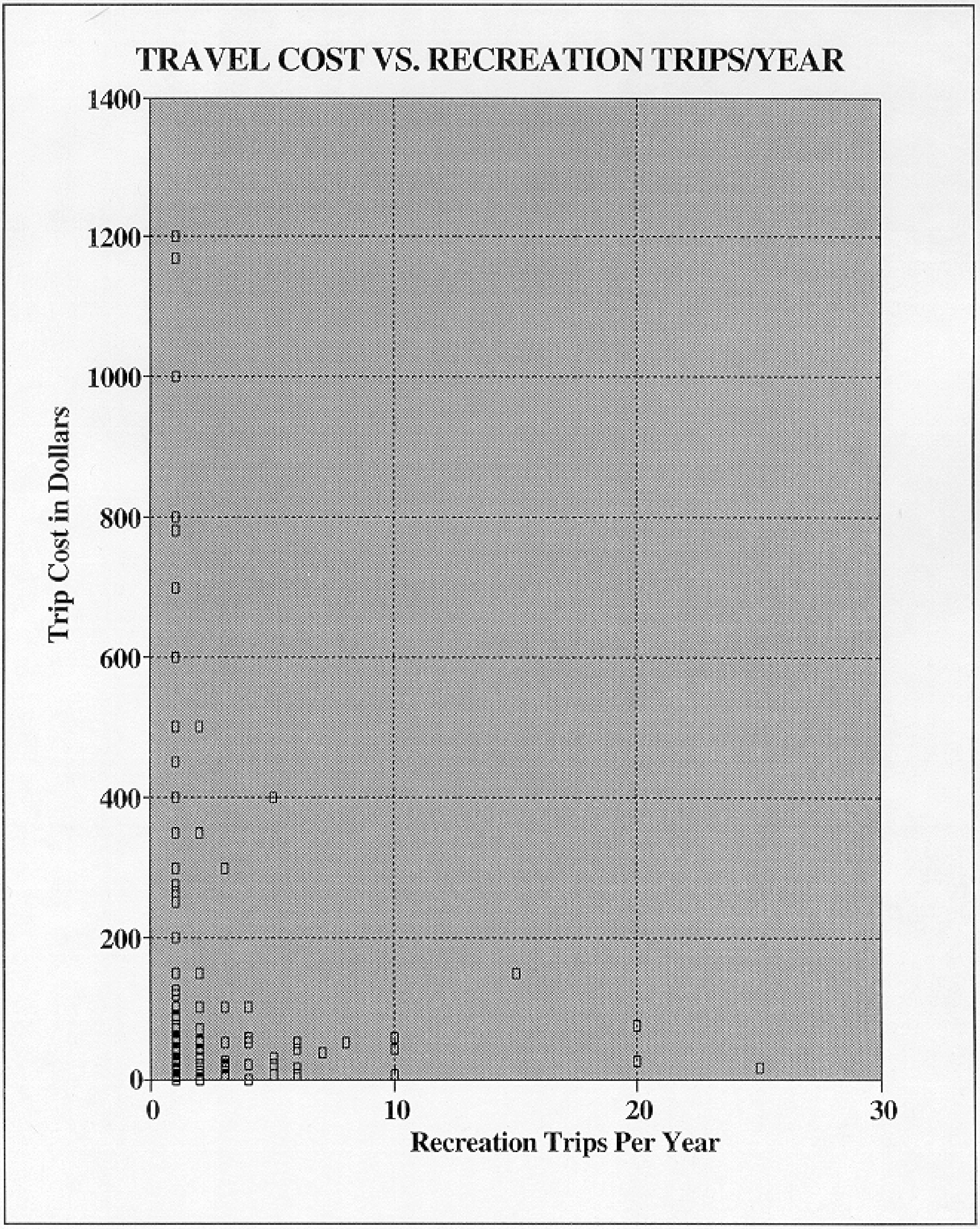

Figure 5 - Travel cost versus recreation trips per year

Bockstael et al. (1987), hereafter B-S-H, provide an alternate model in which time and income are not substituted at the margin. B-S-H show that the time and money constraints cannot be collapsed into one when individuals cannot marginally substitute work time for leisure. Thus, physical travel time and money cost per trip from home to site enter as separate price variables in the demand function. (Figures 5 and 6 show actual money cost and time cost plotted against recreation trips demanded per year). Discretionary time and income enter as separate constraint variables. Money cost and physical time per trip also enter as separate price variables for closely related time-consuming goods such as alternate recreation sites. The B-S-H travel cost model can be estimated as:

$$r = b_0 + b_1 c_0 + b_2 t_0 + b_3 c_a + b_4 t_a + b_5 INC + b_6 DT \qquad \textbf{(1)}$$

where the subscripts o and a refer to own site prices and alternate site prices respectively, *c* is out-of-pocket travel cost per trip, *t* is physical travel time per trip, *INC* is money income, and *DT* is available discretionary time.

Disequilibrium and Equilibrium Labor Market Models

The equilibrium labor market model makes the explicit assumption that opportunity time value rises directly with income. Thus, the methodology that we have rejected assumes perfect substitution between work and leisure. McConnell and Strand

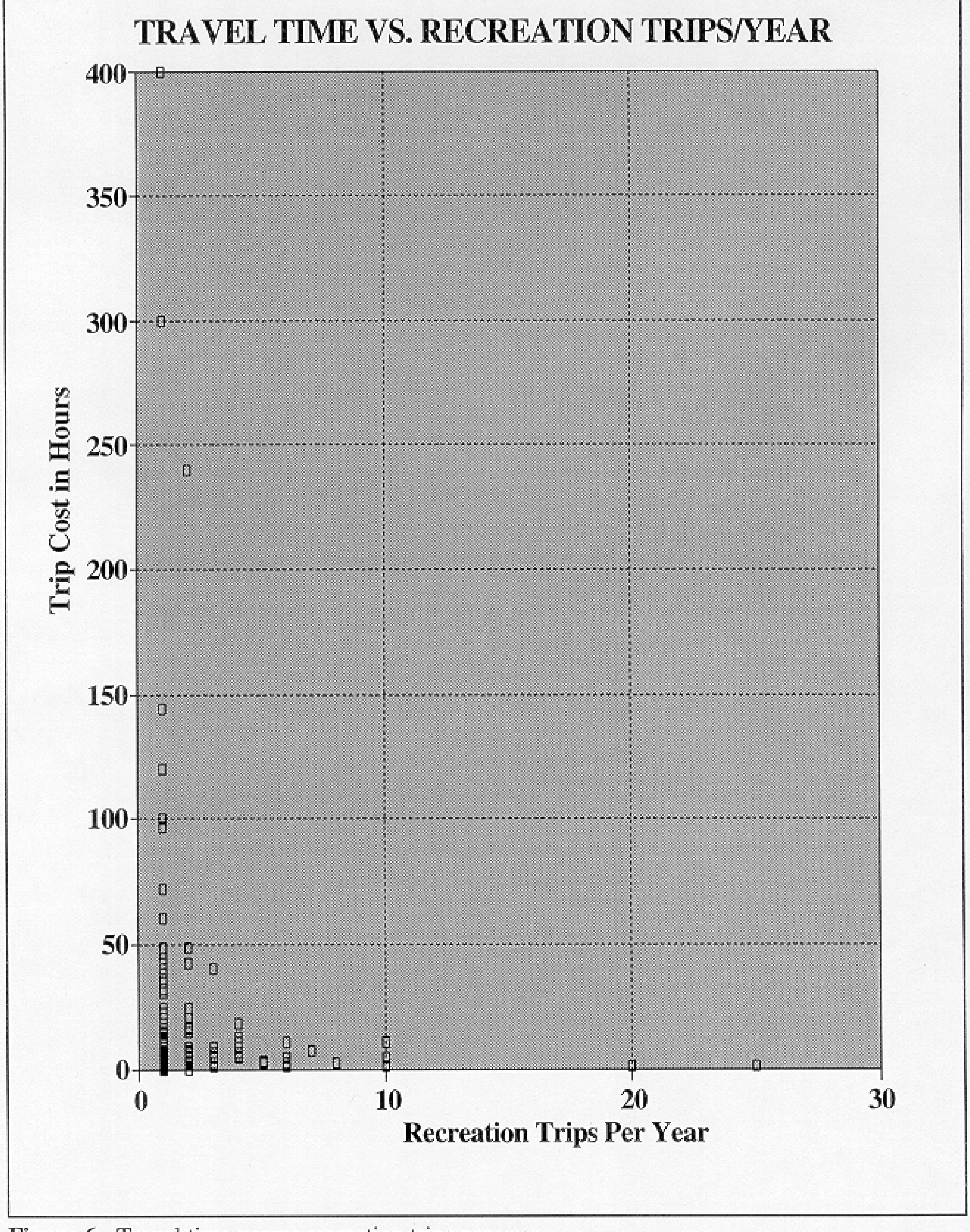

Figure 6 - Travel time versus recreation trips per year

(1981, 1983) (M-S) specify price in their travel cost demand model as the argument in the right hand side of equation two:

$$r = f\left[c + (t)g'(w)\right] \tag{2}$$

where, as before, r is trips from home to site per year, c is out-of-pocket costs per trip, and *t* is travel time per trip. The term g'(w) is the marginal income foregone per unit time. It is assumed in the M-S model that any increase of travel cost, whether it is out-of-pocket spending or the money value of travel time expended, has an equal marginal effect on visits per year. The term [c + (*t*)g'(w)] imposed this restriction because it forces the partial effect of a change in out-of-pocket cost ($\partial f/\partial c$) to be equal in magnitude to a change in the opportunity time cost $\partial f/\partial [(t)g'(w)]$. An important distinction in model specification is demonstrated by M-S. The equilibrium labor market model requires that out-of-pocket and opportunity time value costs be added together to force an identical coefficient on both costs.[5] In contrast, the B-S-H disequilibrium labor market model requires separate coefficients to be estimated for out-of-pocket costs and opportunity time value costs.

Measurement and statistical problems often beset the full price variable in empirical applications. Even for those self-employed persons who are in labor market equilibrium, measuring marginal income is difficult. Simple income questions are unlikely to elicit true marginal opportunity time cost. Only after-tax earned income should be used when measuring opportunity time cost. Thus, opportunity cost may be overstated for the wealthy whose income may require little of their time. Conversely, students who are investing in education and have little market income will have their true opportunity time costs understated. In practice, marginal income specified by theory is usually replaced with a more easily observable measure consisting of average family income per unit time. Unfortunately, marginal and average values of income are unlikely to be the same.

Prices of Closely Related Goods

Ward (1983,1984) proposed that the "correct" measure of price in the travel cost model is the minimum expenditure required to travel from home to recreation site and return since any excess of that amount is a purchase of other goods and is not a relevant part of the price of a trip to the site. This own-price definition suggests that the other (excess) spending during the trip is associated with some of the closely related goods whose prices are likely to be important in the demand specification. For example, time-on-site can be an important good and it is often ignored in the specification of the TCM. Yet time-on-site <u>must be</u> a closely related good since the weak complementarity principle upon which measurement of benefits from the TCM is founded implies that time-on-site is essential. Weak complementary was the term used to connect enjoyment of a recreation site to the travel cost to reach it (Maler 1974). It is assumed that a travel cost must be paid in order to enjoy time spent at the recreation site. Without traveling to the site, the site has no recreation value to the consumer and

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[5]Although the equilibrium labor market model requires that the marginal effects of out-of-pocket cost and income foregone on quantity demanded be equal, empirical results often fail to support the model if the two components of price are entered separately in a regression.

without the ability to spend time at the site the consumer has no reason to pay for the travel. With these assumptions, the cost of travel from home to site can be used as the price associated with a particular recreation site (Loomis et al. 1986).

The sign of the coefficient relating trips demanded to particular time "expenditures" associated with the trip is an empirical question. For example, time-on-site or time used for other activities on the trip have prices which include both the opportunity time cost of the individual and a charge against the fixed discretionary time budget. Spending more time-on-site could increase the value of the trip leading to increased trips, but time-on-site could also be substituted for trips. Spending during a trip for goods, both on and off the site, consist of closely related goods which are expected to be complements for trips to the site. Finally, spending for extra travel, either for its own sake, or to visit other sites, can be a substitute or a complement to the site consumption. For example, persons might visit site "a" more often if site "b" could also be visited with a relatively small added time and/or money cost. If the price of "b" rises, then visits to "a" might decrease since the trip to "a" now excludes "b". Conversely, persons might travel more often to "a" since it is now relatively less expensive compared to attaining "b" (McKean et al. 1996).

Many recreational trips combine sightseeing and the use of various capital and service items with both travel and the site visit, and include side trips (Walsh et al. 1990b). Recreation trips are seldom single-purpose and travel is sometimes pleasurable and sometimes not. The effect of these "other activities" on the trip-travel cost relationship can be statistically adjusted for through the inclusion of the relevant prices paid during travel or on-site and for side trips. Furthermore, both trips and on-site recreation are required to exist simultaneously to generate satisfaction or the weak complementarity conditions would be violated (McConnell 1992). A relation between trips and site experiences is indicated such that marginal satisfaction of a trip depends on the corresponding site experiences. Therefore, the demand relationship should contain site quality variables, time-on-site, and goods used on-site, as well as other site conditions. Exclusion of these variables would violate the specification required for the weak complementarity condition which allows use of the TCM to measure benefits.

In this study of outdoor recreation in the Snake River Basin, an expanded TCM survey was designed to include money and time costs of on-site time (McConnell 1992), on-site purchases, and the money and time cost of other activities on the trip. These vacation-enhancing closely related goods prices are added to the specification of the conventional TCM demand model. Empirical estimates of partial equilibrium demand could suffer under-specification bias if the prices of closely related goods were omitted.[6] Traditional TCM demand models seemingly ignore this well known rule of

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[6] Bias in the consumer surplus estimate, created by exclusion of important closely related goods prices, depends on the sign of the coefficient on the excluded variable, and the distribution of trip distances (McKean and Revier 1990). Exclusion of the price of a closely related good will bias the estimate of both the intercept and the demand slope estimate (Kmenta 1971). Both these effects bias consumer surplus. Since the expression for consumer surplus generally is nonlinear, the expected consumer surplus is not properly measured by simply taking the area under the demand curve. The distribution of trips along the demand function can affect the bias in consumers surplus, depending on the combination of intercept and slope bias created by the underspecification of the travel cost demand. Both intercept and slope biases <u>and</u> the trip distribution must be known in order to predict the effect of exclusion of the price of a related good on the consumer surplus estimate.

econometrics and exclude the prices of on-site time, purchases, and other trip activities which are likely to be the principal closely related goods consumed by recreationists.

Travel Cost Demand Variables

The definitions for the variables in the disequilibrium and equilibrium travel cost models are shown in Table 1. The dependent variable for the travel cost model is (r), annual reported trips from home to the recreation site. Annual recreation trips from home to the Snake River Basin recreation site is the quantity demanded. The average recreationist took 2.76 trips from home to the recreation site in the Snake River Basin during the period April 15, 1998 - November 30, 1998.

Trip Prices - From Home to Site

The money price variable in the B-S-H model is c_r, which is the out-of-pocket travel costs to the recreation site. Our mail survey obtained travel costs for most of those surveyed. Reported one-way travel distance for each party was multiplied times two and times $0.076 to obtain money cost of travel per person per trip. Cost per mile was based on average cost collected from the much larger Lower Snake River Reservoirs survey. Recreationist-perceived cost was used rather than costs constructed from Department of Transportation or American Automobile Association data. Recreationists' perceived price is the relevant variable when they decide how many recreation trips to take (Donnelly et al. 1985). Money price of a trip had the expected negative sign in the estimated model.

The physical time price for each individual in the B-S-H model (disequilibrium labor market) is measured by t_o which is round trip driving time in hours. Average round trip driving time was about 19.65 hours with an average round trip distance of 905.88 miles. Thus, average speed was 46.1 miles per hour. The time price of a trip had the expected negative sign in the estimated model.

Prices of Closely Related Goods

The B-S-H model calls for the inclusion of t_a, round trip driving time from home to an alternate recreation site, as the physical time price of an alternate recreation site. This variable was not significant and appeared to be highly correlated with the monetary cost of travel. Another alternate site price variable is c_a, which is the out-of-pocket travel costs to the most preferred alternate recreation site from the recreationists home. This substitute price variable also was not significant.

The variable to measure available free time is *DT*. The discretionary time constraint variable is required for persons in a disequilibrium labor market who cannot substitute time for income at the margin. Restrictions on free time are likely to reduce the number of recreation trips taken. The discretionary time variable has been positive and highly significant in previous disequilibrium labor market recreation demand studies and was highly significant in this study (Bockstael et al. 1987; McKean et al. 1995, 1996). The average number of days that persons in the survey were "free from other obligations" was 65 days per year.

The income constraint variable (*INC*) is defined as average annual family income resulting from wage earnings. The relation of quantity demanded to income indicates differences in tastes among income groups. Although restrictions on income should reduce overall purchases, it may also cause a shift to low cost types of consumer goods such as outdoor recreation. Thus, the sign on the income coefficient conceptually can be either positive or negative. The estimated coefficient on income was negative for this data set.

Four other closely related goods prices were tested in the model: t_{os}, time spent at the primary recreation site at the river, c_{os} money purchases at the primary recreation site at the river, c_{as}, money spent during the trip at alternate recreation sites in central Idaho during the recreation trip, and recreation time spent at an alternate recreation site in central Idaho during the trip , t_{ar}. Only the latter variable was significant in this data set. The larger the amount of alternate site time during the trip, the greater the number of trips taken.

Other Exogenous Variables

An indicator of taste related particularly to the study region is the number of years that the recreationist has visited the Snake River basin in central Idaho. The variable *EXP* measures this aspect of taste. Recreationists had an average of 10.5 years experience visiting the Snake River Basin. The estimated coefficient on *EXP* was significant and had the expected positive sign.

Age has often been found to influence the demand for various types of recreation activity. The average age of persons in the survey was 40.2 years. Age of the recreationist was tested in the statistical demand model and found non-significant.

RECREATION DEMAND RESULTS

The t-ratios for all important variables to estimate the value of outdoor recreation are statistically significant from zero at the 5 percent level of significance or better. The tests for overdispersion (Cameron and Trivedi 1990; Greene 1992) for the Poisson regression were negative. Thus, unlike the data sets for the Lower Snake River Reservoirs and upstream of Lewiston, Poisson regression was appropriate. However, truncated negative binomial regression is reported. A conservative approach uses the negative binomial model to eliminate any possible overstatement of the t-ratios that might occur with the Poisson regression. In fact, the t-ratios were somewhat higher for the Poisson regression (not shown) than for the negative binomial regression.

Estimated Demand Elasticities

The estimated regression coefficients and elasticities from the truncated negative binomial regression estimation for the Snake River Basin recreation demand models are reported in Tables 2 and 3. Elasticity refers to the percentage change in the dependent variable (trips) caused by a one percent change in the independent variable (unless otherwise noted). Several of the exogenous variables in the truncated negative binomial regressions were log transforms. When the independent variables are log transforms the estimated slope coefficients directly reveal the elasticities. When the independent variables are linear the elasticities are found by multiplying the coefficient times the mean of the independent variable. Elasticity with respect to dummy variables could be estimated for at least three situations, the dummy variable is zero, the dummy variable is one, or the average value of the dummy variable. Given a log transform of the dependent variable, elasticity for a dummy variable is zero if the dummy is zero, the estimated slope coefficient if the dummy is one, and the slope coefficient times the E(dummy) if the average value of the dummy is used. We will report the elasticity for the case where the dummy is one.[7]

Price Elasticity of Demand

Price elasticity with respect to out-of-pocket travel cost is -0.7891. A ten percent increase in travel costs would reduce participation by 7.89 percent.

The elasticity with respect to physical travel time for recreationists was -0.4339. If the time cost of travel required to reach the site increased by ten percent, trips would decrease by 4.34 percent.

Price Elasticity of Closely Related Goods

Time spent during the trip at alternate recreation sites in the Snake River basin, t_{ar}, has a price elasticity of 0.2249. Thus, increases in the amount of time spent at alternative recreation sites during the trip tends to increase the number of trips. The time spent at an alternate site acts as a complementary good to the overall recreation trip experience in central Idaho. Since both the primary site and the alternate site are in the Snake River Basin, it is desired to include both contributions to recreation demand.

Elasticity for Income and Time Constraints

Income elasticity was weakly significant for this data set. Quantity demanded (recreation trips from home to the Snake River per year) was lower for high income persons. The elasticity of -0.3275 indicates that a person with a ten percent higher income level will take 3.28 percent less trips. It is not unusual to find that outdoor recreation is negatively related to income.

Elasticity with respect to discretionary time is 0.4175. As in past studies, the discretionary time variable was positive and highly significant. A ten percent increase in free time results in a very large 4.18 percent increase in recreation trips to the Snake River Basin. As expected, available free time acts as an important constraint on the number of recreation trips taken per year.

Elasticity With Respect to Other Variables

The recreation experience variable, *EXP*, was highly significant. The coefficient showed that those who have recreated in the Snake River Basin over a long period of time tend to make more trips

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[7] Let the regression equation be $\ln(r) = \alpha_1 + \alpha_2 D + \alpha_3 \ln(Z)$ where Z represents all the continuous independent variables. The equation can be written as $r = e^{(\alpha_1 + \alpha_2 D)} Z^{(\alpha_3)}$. Elasticity of r with respect to D is defined as ε = (% change in r) / (% change in D) = $(\partial r/\partial D)(D/r)$. $\partial r/\partial D = \alpha_2 e^{(\alpha_1 + \alpha_2 D)} Z^{(\alpha_3)}$; D can be 0, 1, or E(D); and r is defined above. Elasticity reduces to $\varepsilon = \alpha_2 D$. Thus, ε becomes zero if D is zero and ε takes the value α_2 if D is one.

to the area. A ten percent increase in years visited the river results in a very large 7.22 percent increase in annual trips to the river.

Consumers Surplus per Trip

Consumers' surplus was estimated using the result shown in Hellerstein and Mendelsohn (1993) for consumer utility (satisfaction) maximization subject to an income constraint, and where trips are a nonnegative integer. They show that the conventional formula to find consumer surplus for a semilog model also holds for the case of the integer constrained quantity demanded variable. The Poisson and negative binomial regressions, with a linear relation on the explanatory own monetary price variable are equivalent to a semilog functional form. Adamowicz et al. (1989) show that the annual consumers surplus estimate for demand with continuous variables is E(r)/(-ß), where ß is the estimated slope on price and E(r) is average annual visits. Consumers surplus per trip from home to site is 1/(-ß). (Also note that the estimate of consumers surplus is invariant to the distribution of trips along the demand curve when surplus is a linear function of Q. Thus, it is not necessary to numerically calculate surplus for each data point and sum as would be the case if the surplus function was nonlinear.)

Consumers Surplus Per Trip From Home to Site

Estimated coefficients for the travel cost model with labor market disequilibrium, and assuming travel cost per mile of 7.6 cents per mile per person are shown in Table 2. The assumption of 7.6 cents per mile per person is identical with that used in the fishing and recreation demand models estimated for the four reservoirs on the Lower Snake River (Normandeau Associates et al. 1998b) and on the Free Flowing Snake River above Lewiston (Normandeau Associates et al. 1998d).[8]

Application of truncated negative binomial regression, and using recreationist-reported travel distance times $0.076 per mile per person to estimate out-of-pocket travel costs, results in an estimated coefficient of -0.011462 on out-of-pocket travel cost. Consumers surplus per recreationist per trip is the reciprocal or $87.24. Average recreationist trips per year in our full 288-person sample was 2.76. Total surplus per recreationist per year is average annual trips x surplus per trip or 2.76 x $87.24 = $241 per year.

Total Annual Consumers Surplus for Outdoor Recreation

An important objective of the demand analysis was to estimate total annual willingness-to-pay for recreation in the Snake River Basin. As discussed above, consumer surplus was estimated at $87.24 per person per travel cost trip. The average number of recreation trips per year from home to the Snake River Basin was 2.76 resulting in an average annual willingness-to-pay of $241 per year per recreationist. The annual recreation value of the Snake River Basin for our sample of recreationists or willingness-to-pay by those in our sample of 190 recreationists is 190 x $241 = $45,790 per year.

The total annual willingness-to-pay for all recreationists requires knowledge of the total

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[8] This assumes that anglers in the Snake River Basin and anglers on the four reservoirs on the Lower Snake River use vehicles having similar fuel efficiency. Money travel cost per mile for a vehicle is based on the much larger sample (537 observations versus 190 observations) collected for the reservoirs.

population of recreationists which frequent the Snake River Basin. The number of nonangler recreationists visiting central Idaho was estimated to be 180,000 per year. The number of recreationists was derived from data collected in the spending survey and published information on traveler spending for the States of Idaho and Oregon. The detailed derivation is shown in the second section (the input-output spending survey) of this report. Total annual consumer surplus for nonangling recreationists in central Idaho is estimated to be 180,000 x $241 = $43.4 million per year.

Comparison of Willingness-To-Pay With Other Studies

Comparisons of net benefits for outdoor recreation among demand studies is difficult because of differences in the units of measurement of consumption or output. Comparisons of value per person trip are flawed unless all studies compared have similar length of stays. Comparisons of value per person per day are difficult because some sites and activities can occur all day (or even at night) and others only at certain hours. Conversion problems for recreation consumption data makes exact comparison among studies impossible. Many studies are quite old and the purchasing power of the dollar has declined over time. Adjustment of values found in older studies to current purchasing power can be attempted using the consumer price index. Another problem with older studies is the changes in both economic and statistical models used to measure value. Adjustment for different travel cost model methodologies, as well as contingent value methodologies, and inflation, is shown in Walsh et al. (1988a; 1988b; 1990a). Some of the more recent studies used higher cost per mile than we did for travel and also used income rate as opportunity time cost that was added to the monetary costs of travel. If these outmoded methods resulted in an overstatement of travel cost, a near proportional overstatement of estimated consumer surplus will occur. In addition, some of the studies used Poisson regression and obtained extremely large t-values. Although no test for overdispersion was mentioned, the very high t-values suggest that the requirement of Poisson regression that the mean and variance of trips per year be equal was violated. If that is the case, the Poisson regressions are inappropriate and should have been replaced with negative binomial regression.

Cameron et al. (1996) developed individual travel cost recreation models to predict the effect of water levels on all types of recreation at reservoirs and rivers in the Columbia River Basin. See Appendix J-1, COE *Columbia River System Operation Review* (*CRSOR*) (1995). The baseline (1993 water levels) estimates of consumer surplus varied between $13 and $99 per person per summer month over the nine sites. Annual estimates per trip were not reported. The study included recreation at Lower Granite Reservoir with a sample of 168 persons. The results for Lower Granite Reservoir were extrapolated to the other three Lower Snake River reservoirs. Consumer surplus per recreation day for summer recreation can be found using average visitor days shown in Tables 6,2g-6,2j and total summer consumer surplus shown in Tables 6,3g-6,3j (*CRSOR*). Division of total consumer surplus by average recreation days result in: Ice Harbor Reservoir $51.21 per recreation day, Lower Monumental Reservoir $40.33 per recreation day, Little Goose Reservoir $42.69 per recreation day, and Lower Granite Reservoir $35.40 per recreation day. Recreation days varied from 138,400 at Lower Monumental Reservoir to 1,670,600 at Lower Granite Reservoir. Values found for other reservoirs in the study included John Day Reservoir at $20.14 per recreation day, Lake Roosevelt Reservoir at

$53.27 per recreation day, and Dworshak Reservoir at $54.01 per recreation day.

The values found in *CRSOR* (Cameron et al. 1996) are higher than estimated herein. Changes in consumer surplus estimated by the travel cost method are almost directly proportional to the changes in travel cost value that is used as price in the demand function. One reason for the high values in the *CRSOR* study is that the vehicle cost used in the price variable was $0.29 cents per mile (Department of Transportation estimate) whereas our vehicle cost was $0.202 per mile (based on our survey data). The price perceived by travelers is the appropriate measure. DOT data include fixed costs that are not relevant when making incremental trip decisions (Donnelly et al. 1985). In addition, Cameron et al. 1996, added in an opportunity time cost of travel based on estimated travel time valued at the reported average wage rate (see *CRSOR*, Appendix J-1, bottom of Table 5,4). Our methodology did not include a money cost of time in travel cost and physical travel time was included as a separate site price variable. Their assumption that all recreationists give up earnings when traveling to the site is incorrect based on their own survey data. The fraction of persons who stated they gave up some income to visit the sites appears to be only about 10 percent (about 19 persons) in their sample of 186 at Lower Granite Reservoir (see *CRSOR*, Cameron et al. 1996, Appendix B2 Survey Results part E, *About Your Typical Trips*).[9] The ten percent of visitors that gave up some income probably did so either on the way to the site or on the return trip but not both ways. The appropriate foregone income amount would only apply to half the trip time and to only ten percent of the visitors. Based on the survey characteristics of typical trips, the foregone income component of travel cost was overstated by about 95 percent. Their travel cost measure also included lodging costs which are discretionary and are not usually considered part of the cost of a recreation trip (*CRSOR*, Appendix C). Their average "round trip transportation cost" to travel to the Lower Snake River reservoirs was about $23.37 per trip per person whereas ours was about $9.93 per trip per person.

English and Bowker (1996) estimated travel zonal cost models for outfitted rafting on the Chattooga River which forms the border between Georgia and South Carolina. The mail survey resulted in 331 useable responses which was reduced to 214 observations when organized groups were removed. They experimented with several definitions of travel cost, all of which excluded foregone income. If travel cost was assumed to be $0.15 per mile, the consumer surplus per trip was $31.66. At the other extreme, if all outfitter costs, transportation, lodging, activities, and food costs were included as part of the travel cost then consumer surplus increased to $104.64 per trip.

Bowker, et al (1996) reported on two individual observation travel cost models which used truncated negative binomial regression. The study was on commercial guided rafting on the Chatooga and Nantahala rivers in Georgia, South Carolina and in North Carolina. The mail surveys resulted in 369 and 376 useable responses respectively. They conclude that $0.092 per mile per person is in line with reported variable travel expenses and caution against the very high values used in some studies. Consumer surplus estimated are presented for various level of assumed foregone income and for reported cost versus a fixed cost per mile. With no foregone income and imputed cost of 9.2 cents per

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[9] About 12.5 percent of recreationists in this sample indicated they gave up some income to travel to the recreation site. Our prior survey of anglers resulted in 11.9 percent indicating they gave up some income to travel to the fishing site.

$89.03 on the Nantahala River. The estimates of consumer surplus per person per trip can rise as high as $286 dollars when it is assumed that 50 percent of the wage rate is foregone during the trip.

Michaleson (1977) used the individual observation travel cost method to estimate the value of camping associated with wild and scenic river recreation in Idaho. The imputed value of time was included in travel cost. He reported a value of $9 per activity day in 1971 dollars. Michaleson and Gilmour (1978) estimated the value of outdoor recreation trips associated with camping. An imputed value of time was included in travel cost. The study method was individual observation travel cost and used on site interviews in Sawtooth Valley, Idaho. The average value was $3.73 per person per day in 1971 dollars.

Brown and Plummer (1979) used the hedonic travel cost method to find the value of camping in western Washington. The imputed value of time was excluded from travel cost. They found a value for camping of $5.83 per person per day in 1976 dollars.

Sutherland (1980) used the zonal travel cost method to estimate the values of camping, swimming, and motorized boating in Idaho, Oregon and Washington states. The imputed value of travel time was excluded from travel costs. Values of $4.23 per person per day for camping, $4.31 per person per day for swimming, and $4.24 per person per day for motorized boating (all in 1979 dollars) were found.

Findeis and Michalson (1984) used a modified individual observation travel cost method to estimate the value of camping at developed sites in the Targhee National Forest in Idaho. An imputed value of time was included in travel cost. They found a value of $8.60 to $17.93 per person per day in 1974 dollars.

Daniels (1987) applied a zonal travel cost model in a study of visitors to four campgrounds in Lolo National Forest in Montana. An imputed value of time was included in travel cost. One-third of the sample were nonresidents and were all deleted on the grounds that the campgrounds were not their primary destination. An average value of $17.82 per person per day was found (in 1984 dollars).

Brox and Kumar (1997) apply a multi-site travel cost model for camping at 48 provincial parks in Ontario, Canada. The imputed value of time was excluded from travel cost but the arbitrary (government reimbursement rate) value for travel cost per mile was overstated. They report values per trip varying by park from $1.80 to $7,000 with most values under $300 per trip in 1990 dollars.

Knetch et al. (1976) used a zonal travel cost model to estimate the demand for day trips to California reservoirs where picnicking made up a large part of the activities. Truncation to day use only reduced the values significantly. An imputed value of time was included in travel cost. They found a value of $3.33 in 1969 dollars.

Walsh et al. (1980) measured the value of camping, picnicking and fishing on high country reservoirs located along the eastern slopes of the Rocky Mountains in Colorado. They used noniterative open-ended contingent value questions in on site interviews. They found a value of $10.90 per person per day in 1978 dollars.

Walsh and Olienyk (1981) applied an iterative contingent value survey on site to value picnicking at five recreation sites in national forests on the eastern slopes of the Rocky Mountains in Colorado. They found a value of $6.22 per person per day in 1980 dollars.

Ward (1982) estimated the demand for recreation (picnicking, boating, swimming) at reservoirs in southeastern new Mexico. He used an individual observation travel cost for model. An imputed value of time was included in travel cost. The survey was truncated to neighboring counties which would understate value. He found a value of $11.39 per person per day in 1978 dollars.

Rosenthal (1987) applied a zonal travel cost model to study recreation demand at 11 reservoirs in Kansas and Missouri. Recreation activities included picnicking, swimming, fishing and boating. The sample was limited to one-day trips which would understate value. An imputed value of time was included in travel cost. He found values of $4.04 to $7.10 per person per day in 1982 dollars depending upon treatment of substitute sites.

Wade et al. (1988) used a zonal travel cost model to find the demand for swimming at 14 reservoirs in California. An imputed value for time was included in travel cost.
The estimated value per person per day ranged from $15.84 to $35.04 in 1985 dollars. They also estimated the value of motorized boating on Lake Havasu in Arizona and at 12 reservoirs in California. An imputed value of time was included in travel cost. They found a value at Lake Havasu of $34.64 per day in 1985 dollars. Lake Havasu is unique for a number of reasons including reconstruction of the original London Bridge. Motorized boating at the California reservoirs was double in southern California compared with reservoirs in the rest of the state. The average value for motorized boating on reservoirs in California was $24.28 per person per day in 1985 dollars.

Brooks (1988) used a travel cost model to estimate the value of deer hunting in Montana. An imputed value of time was included in travel cost. The sample included both resident and nonresident hunters. Average value per person per day varied from $20.88 to $54.94 in 1986 dollars.

Offenbach and Goodwin (1994) estimate the demand for deer hunting in Kansas. They use an individual observation travel cost model estimated using the negative binomial regression technique. An imputed value of time was excluded from travel cost but costs for food and lodging were added to transport costs. They found value per trip of $160.79 to $176.55 in 1988 dollars. Data were not reported allowing conversion of value per trip to value per person per day.

Table 1. Definition of variables [10]

Variable	Definition
r	annual trips from home to the Snake River Basin recreation site (dependent variable).
$\boldsymbol{c_o}$	recreationist's out-of-pocket round trip travel cost to the Snake River Basin recreation site (dollars).
L(*t_o*)	round trip travel time to the recreation site (hours).
L(*t_{ar}*)	time spent at an alternate recreation site during the trip in the Snake River Basin (hours).
L(*INC*)	annual family earned and unearned income (dollars).
L(*DT*)	recreationist's discretionary time available per year (days).
L(*EXP*)	recreationist's total recreation experience in the Snake River Basin (years).

Table 2 Snake River Basin recreation demand.

Variable	Coefficient	t-ratio	Mean of Variable	Elasticity
Constant	0.8961	0.32	na	na
c_o	-0.01146	-2.41	68.85	-0.79
L(t_o)	-0.4339	-1.93	19.65	-0.43
L(t_{ar})	0.2249	1.83	13.21	0.22
L(*INC*)	-0.3275	-1.29	62592.00	-0.33
L(*DT*)	0.4175	2.36	64.55	0.42
L(*EXP*)	0.7216	4.48	10.51	0.72

Travel cost per mile per recreationist assumed to be $0.076. Truncated Negative Binomial Regression[11], r = trips per year to the river (r = dependent variable), mean r= 2.32. $R^2 = 0.24$ (Estimated by a regression of the predicted values of trips from the truncated negative binomial model on the actual values.)

[10] L in front of the variable indicates a log transformation.

[11] See Appendix I for a discussion of the statistical methodology.

Table 3. Effects of exogenous variables on recreation trips per year

Exogenous Variable	Effect on Trips/Year of a +10% Change
Recreationist's Money Cost of Round Trip (dollars/trip)	-7.89%
Recreationist's Round Trip Travel Time (hours/trip)	-4.34%
Recreationist Time Spent at Other Recreation Sites During the Trip	2.25%
Annual Family Income (dollars/year)	-0.33%
Recreationist's Discretionary Time Available (days/year)	4.18%
Recreationist's Total Years of Recreation Experience In the Snake River Basin (years)	7.22%

OUTDOOR RECREATION EXPENDITURES

Recreationists were contacted at recreation sites over the period from April 15, 1998 through November 30, 1998 and requested to take part in the outdoor recreation spending mail survey. Most persons contacted on-site were agreeable to receiving a mail questionnaire and provided their name and mailing address. Persons on guided tours or guided rafting trips were not directly accessible and tour guides mailed or handed out surveys to their clients. The outdoor recreation spending survey data are expanded to show the direct economic effects on spending, earnings, and employment in central Idaho.

The spending survey provided a list of potential spending choices and requested the amount spent and the location for each of the spending categories. Separate forms were provided for spending during travel to the site, spending while at the site, and spending on the trip home. The outdoor recreation input-output spending survey resulted in a sample of 402 completely useable responses. Because of the varied ways in which surveys were distributed it was not possible to calculate a response rate. The outdoor recreationist input-output spending survey collected detailed information on the types of purchases and the place the purchase occurred. Separate data were collected for the trip, while on-site, and on the trip home. Expenditure data for some 26 seller categories were obtained. The name of the town nearest where each purchase occurred was collected allowing estimation of average purchases for each of the seller categories for a large number of towns and counties.

The outdoor recreationist spending survey showed spending patterns useful in estimating the stimulus to jobs and business sales in the region created by recreationists attracted to the reservoirs. The total economic effects of sportfishing include both the initial spending stimulus on sales, employment, and personal income and the indirect economic effects as the initial spending effects spread throughout the local economy. This study estimates the initial economic effects which will be used in a separate economic multiplier study that estimates the total economic effects. The recreation spending survey data are expanded to show the direct economic effects on spending, earnings, and employment in central Idaho.

Geographic Location of Recreation Economic Impacts

Table 4 is based on the outdoor recreationist input-output spending survey that contained 402 useable observations on the variable trips by distance. The table shows that only 14 visitors, or about 3.5 percent of the sample, lived within a 50 mile radius of the recreation site. The number of visitors living between 50 and 100 miles from the recreation site was 44 which was about 11 percent of the sample. About 55 percent of the sample lived

Table 4 Anglers and recreationists by distance traveled

Miles One Way	Anglers	Recreationists
50	30	14
100	38	44
150	52	50
200	31	49
250	19	28
300	14	19
350	14	10
400	14	6
450	8	14
500	4	12
550	3	2
600	6	12
650	1	1
700	0	2
750	0	0
800	1	4
850	1	4
900	1	4
950	0	1
1000	1	15
1050	0	0
1100	0	0
1150	0	0
1200	1	6
1250	1	0
1300	0	8
1350	0	0
1400	0	2
1450	0	0
>1450	6	43

Table 5 Spending by recreationists traveling to Central Idaho.

Type of Purchase	Average Expenditure per Outdoor Recreation Group
County Government	$1.84
State Government	$8.23
Federal Government	$0.97
Bus/Taxi	$4.16
Tour Boat	$50.69
Airline	$108.19
Auto/Truck/RV Rental	$16.29
Service Station #1	$24.98
Service Station #2	$8.27
Grocery Store	$25.27
Auto Dealer	$61.34
Clothing Store	$9.32
Boat/Marine Store	$126.00
Sporting Goods Store	$8.19
Hardware Store	$1.24
Restaurant	$37.64
Department Store	$2.30
Other Retail	$3.32
Lodging	$57.91
Guide Services	$144.73
Equipment Rental	$9.98
Parking & Car Wash	$1.25
Auto Repair	$6.53
Other Repair	$1.13
Entertainment	$9.80
Health Services	$0.65
All Other Purchases	$18.54

Table 6 Spending by recreationists while staying in Central Idaho

Type of Purchase	Average Expenditure per Outdoor Recreation Group
County Government	$1.86
State Government	$3.76
Federal Government	$0.74
Bus/Taxi	$11.94
Tour Boat	$56.27
Airline	$3.36
Auto/Truck/RV Rental	$2.79
Service Station #1	$8.69
Service Station #2	$1.55
Grocery Store	$12.39
Auto Dealer	$0.45
Clothing Store	$4.31
Boat/Marine Store	$1.47
Sporting Goods Store	$2.69
Hardware Store	$0.76
Restaurant	$31.10
Department Store	$0.27
Other Retail	$13.81
Lodging	$52.79
Guide Services	$248.07
Equipment Rental	$0.99
Parking & Car Wash	$0.29
Auto Repair	$6.49
Other Repair	$0.00
Entertainment	$3.37
Health Services	$1.23
All Other Purchases	$8.64

Table 7 Spending by recreationists returning home from Central Idaho

Type of Purchase	Average Expenditure per Outdoor Recreation Group
County Government	$0.00
State Government	$0.25
Federal Government	$0.00
Bus/Taxi	$0.01
Tour Boat	$1.54
Airline	$20.45
Auto/Truck/RV Rental	$3.98
Service Station #1	$12.73
Service Station #2	$3.72
Grocery Store	$6.09
Auto Dealer	$0.03
Clothing Store	$0.47
Boat/Marine Store	$0.00
Sporting Goods Store	$0.27
Hardware Store	$0.08
Restaurant	$14.46
Department Store	$0.94
Other Retail	$0.12
Lodging	$10.13
Guide Services	$1.12
Equipment Rental	$0.00
Parking & Car Wash	$0.30
Auto Repair	$0.10
Other Repair	$0.00
Entertainment	$1.21
Health Services	$0.87
All Other Purchases	$0.00

within 400 miles of the sites in central Idaho where they recreated.[12]

Expenditure Per Visitor per Year and Total Annual Spending

Summing the detailed expenditures collected in the spending survey and shown in Tables 5 - 7 results in a spending total of $1,307.71 x 402 = $525,699 for the 402 recreationist groups in the survey.

Total annual spending by all travelers visiting central Idaho was estimated at $298.8 million per year (1998 dollars). Visitor spending by county was taken from reports prepared for Idaho Division of Tourism Development and for the Oregon tourism Commission, Economic Development Department by Dean Runyan Associates. Data for 1996 and 1997 were inflated to 1998 using the consumer price index. We estimated that $162.8 million per year was spent by anglers[13] in central Idaho leaving $136 million per year attributed to non-angler river recreationists. Dividing the annual river recreation spending ($136 million) by our survey average annual spending per recreationist group ($1,307.71) yields 104,000 non-angling recreationist groups. Group size was 1.7305 resulting in 104,000 x 1.7305 = 180,000 unique river recreationists.[14] Annual spending per river recreationist is $136 million/180,000 = $755.55 per year.

Recreation Expenditure Rates by Town

The database collected by the outdoor recreation spending survey allows detailed measurement of spending by community or county, by type of purchase, and by travel to site, on-site, or return trip. For example, for every 100 recreationists visiting the recreation sites, a specified town or county will have so many dollars of sales by each economic sector during the trip to the recreation site, while on-site and on the return trip. Towns where outdoor recreationist spending occurred are identified in the database.

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[12] In contrast, the spending survey on the four Lower Snake River reservoirs found that 64 percent of the sample lived within 50 miles of the reservoirs where they recreated.

[13] Based on the data from the spending survey for recreationists and estimates of the number of anglers visiting the Upriver Subregion.

[14] Our survey question for group size was misinterpreted as rafting group size resulting in an overstated value. Average group size of 1.7305 was from an economic impact study of rafting on the Middle Fork of the Salmon River in Idaho (English and Bowker 1996).

Table 8 Overnight lodging by anglers.

Type of Lodging	Percent of Anglers
Camper	4.42%
Trailer	4.73%
Commercial Campground	6.31%
Motel	12.62%
With Friends	3.79%
Public Campground	15.77%
Didn't Stay Overnight	13.25%
Other Lodging	39.11%

Recreation Lodging

About 87 percent of 317 recreationists in the travel cost demand survey[15] stayed overnight at the recreation site. Table 8 shows that, of those recreationists that do stay overnight, only a small fraction stay at motels or commercial campgrounds. Most of the overnighters stayed in campers, trailers, tents, or in other accommodations.

Recreation Mode of Transportation

Method of travel used by the 402 recreationists in the input-output spending survey sample was classified into eight categories as shown in Table 9. As expected, personal car/van/truck dominated the transport method. Airplane was second most likely to be used for transport (excluding the All Other category).

[15] The travel cost demand survey in central Idaho was conducted concurrent with the spending survey.

Table 9 Type of transportation used by recreationists [1/]

Mode of Transport	% of Sample
Personal Car/Van/Truck	71.14
Rented Car/Van/Truck	7.21
Personal Camper/RV	12.44
Airplane	15.42
Rented Camper/Mobile Home/RV	0.25
Bus	4.98
Tour Bus	4.73
Tour Boat	2.49
All Other	44.78

1/ Total percent exceeds 100 because many recreation groups used more than one transportation type.

Importance of Recreation Activities During the Trip

Recreationists were asked to rate 17 recreation activities using a scale from one to five where one was most important and five was least important. The results of this survey question are shown in Table 10. The question was phrased, "what recreation activities were important to you and your group on this trip?"[16]

Table 10 shows the number of recreationists responding for each recreation category. Many persons did not rate all of the types of recreation on the questionnaire. For example, only 76 persons out of 402 responded to the "other" category. Evidently recreationists avoided rating recreation activities that were undefined or irrelevant to them. It was assumed that recreationists had a low opinion on the categories of recreation that they left blank (blanks were set to 5) and thus the averages for most categories tend to be low. However, the response rate itself may be an indicator of recreationist interest in different types of recreation. Six recreation categories drew a response from more than half the recreationists: rafting, nature viewing, camping, sightseeing, wildlife watching, and hiking. The activities with the highest rating included rafting (rated 1.85), camping (rated 3.11), and sightseeing (rated 3.25). It is clear from the rankings that the recreationist group (which was selected to

[16] The average group size question failed in this survey apparently respondents thought it referred to the size of a guided raft or tour group instead of the household group.

exclude primary anglers) visits central Idaho rivers mainly to engage in nature viewing, wildlife watching, camping, and sight seeing while rafting or while hiking.

Table 10 Importance of recreation activities during the outdoor recreation trip

Type of Recreation Activity While on Outdoor recreation Trip	Number of Recreationists Responding to Question out of 402 Surveyed	Average Rating to Group (1 = most important, 5 = least important) Nonresponses Excluded
Steelhead Fishing	140	4.82
Smallmouth Bass Fishing	143	4.81
Trout Fishing	166	4.59
Sturgeon Fishing	141	4.81
Bull Trout Fishing	136	4.89
Jet Boating	154	4.59
Camping	262	3.11
Other	76	4.48
Rafting	346	1.85
Kayaking	198	3.82
Canoeing	143	4.58
Hiking	216	3.79
Bird Watching	166	4.26
Wildlife Watching	230	3.62
Sightseeing	257	3.25
Biking	148	4.68
Nature Viewing	271	3.01

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APPENDIX I - Statistical concerns for demand curve estimation

Truncated Poisson or truncated negative binomial regression is appropriate for dependent variables with count data (integer), and truncated negative binomial regression is used in this study (Greene 1981; Creel and Loomis 1990, 1991; Hellerstein and Mendelsohn 1993). An alternate approach is to separate the decision process into two parts. The potential visitor first decides whether or not to visit the site. For those who decide to visit the site a second decision is made on the number of visits per year. Two stage estimation techniques such as Tobit, Heckman, and Cragg models do not account for the integer nature of the recreation trips variable resulting in significant error (Mullahy 1986). Because the data for the dependent variable (visits per year), are integers, truncated below one visit per year, equation estimation by ordinary least squares regression (OLS) is inappropriate. Truncation occurs when part of the data are excluded from the sample. The on-site survey excluded persons not consuming recreation at the study site. Maddala (1983) shows that the regression slopes estimated by OLS will be biased toward zero when the dependent variable data are truncated. The result is that the least squares method understates price elasticity and overstates consumers' surplus. Price elasticity is defined as the percentage change in quantity demanded (trips) caused by a one percent change in money trip price (out-of-pocket cost of a trip).

Poisson and negative binomial regression functional form is mathematically equivalent to a logarithmic transformation of the dependent variable. Most of the independent variables are log transformed. The resulting functional form for these variables in the demand equation is double log. Out-of-pocket travel cost is not transformed resulting in a semi-log functional form.

The significance of the coefficients in a Poisson regression can be greatly overstated if the variance of the dependent variable is not equal to its mean (over-dispersion). The negative binomial regression does not have this shortcoming but the iterative solution process sometimes fails to converge.[17] Convergence was not a problem for this data set. Tests for over-dispersion in the truncated Poisson regressions were positive. Tests developed by Cameron and Trivedi (1990), and shown in Greene (1992), were conducted. These tests indicated that over-dispersion was present in the Poisson regression models. Also, the t-values appeared inflated in the Poisson regressions. A second test is available by actually running the negative binomial regression. When the truncated negative binomial regression was estimated, the coefficient on the over-dispersion parameter, ", was 3.02 with a t-value of 1.30. This result provided weak evidence of over-dispersion based on the t-value. The negative binomial model implies var(r)/E(r) = {1 + " E(r)} = {1 + 3.02 E(r)} and our sample estimate of E(r) was 2.3 recreation trips from home to the river per year. The Poisson model assumption that var(r)/E(r) = 1 is violated. The t-values found in the truncated negative binomial model were smaller than in the truncated Poisson model. That result was further evidence that Poisson model

[17] The distinguishing characteristic of many recent non-linear econometric estimation techniques is that the have no explicit analytical solution. In such cases an iterative numerical calculation approach is used (Cramer 1986).

had over-dispersion. Therefore, the truncated negative binomial regression technique was used in place of truncated Poisson regression.

APPENDIX II - QUESTIONNAIRES

FIELD(FirstName) FIELD(LastName)
FIELD(Address)
FIELD(City), FIELD(State) FIELD(PostalCode)

Dear FIELD(FirstName) FIELD(LastName),

Recently you helped the University of Idaho by participating in a use survey at FIELD(Where Contacted) on the Snake River. It is our understanding that you, or a household member who was present on the first survey, would be willing to assist this project by completing the attached “Follow-up” survey for a more in-depth view of the Snake River. The information you supply concerning the money you or your party spent in going to the recreation site, at the site, and returning home is of high importance for this study.

Please find enclosed a stamped pre-addressed envelope for mailing to the project home office.

All information will be confidential and will be used only as totals with no individual names or information released to any person or agency.

Thank you for your assistance in completing the survey forms.

Sincerely,

Project Consultant

RECREATION SURVEY   SNAKE RIVER IN CENTRAL IDAHO
(OMB #0710-000 Expires September 30, 1998)

Thank you for agreeing to participate in this recreation survey. This questionnaire pertains to the Snake River, in central Idaho, near where you were surveyed.

1. Circle one ... **{mainly recreate on boat}   {mainly recreate on bank}**
{equal amount on boat and bank}

2. Circle one ... stayed in: **{camper}   {trailer}   {commercial campground} {motel}   {with friends}**
{public campground}   {didn't stay overnight}   {other, describe:__________________________ }

3. How many people are in your group? _________ **people**

4. Typically, how many days per year are you on recreation trips in central Idaho where you were surveyed?
_________ **days per year**

5. Typically, how many days per year are you on recreation trips to places other than central Idaho?
_________ **days per year**

6. Please rank the importance of the following activities.
Where one is most important and ten is least important.
Swimming <   >, picnicking <   >, camping <   >, motor boating <   >,
sailing <   >, wildlife viewing <   >, hunting <   >, fishing <   >,
other <   >

1. How many miles (one-way) is it from your home to the river where you were surveyed? _________**miles one-way**

8. Circle all that apply ... How did you travel to the central Idaho recreation site?
{car}   {boat}   {bus}   {plane}   {pickup truck}

9. How many years have you recreated on the Lower Snake River in central Idaho? _______ **years**

10. How many days per year are you free from other obligations so that you could undertake recreation?
______ **days per year**

11. What is your total time (hours) away from home on a typical trip to the site where you were surveyed?
______ **hours**

12. What is the typical total cost to you of a trip to the recreation site where you were surveyed including round trip transportation, equipment, supplies, food, accommodations, entertainment, etc.? **$ ______ cost to you.**

13. Please enter your typical hours away from home and typical trip cost (answered above) in the last row of the table below.

Column 2: please allocate hours away from home across the trip activities listed on the left.

Column 3: please allocate trip cost across the activities listed on the left.

(1) TRIP ACTIVITY	(2) HOURS AWAY FROM HOME	(3) TRIP COSTS IN DOLLARS
Recreating at the river		
Recreating at other sites than the river in central Idaho during the trip		
Travel to and from the recreation site from your home		
Other recreation activities at the river		
Recreation at other places than the river during the trip		
Other Activities on Trip (explain below)*		
	TOTAL HOURS =	**TOTAL DOLLARS =**

Please describe other activities on trip____

14. What is your occupation? Describe type of employment, or student, housewife, retired, unemployed, school teacher, truck driver, etc.____________________________________

15. How many days of vacation, excluding weekends, do you typically take each year? ______ **days per year**

16. What is the one-way distance from your home to your most preferred alternative recreation site if you didn't recreate in central Idaho? _____ **miles one-way**

17. What is the name & location of your most preferred alternative recreation site?
____

18. Circle one ... Will you typically leave the site where you were surveyed for alternative sites if recreation conditions are bad here?
{yes} **{no}**

19. If the answer to question 18 above is yes, what is the distance one-way from the site where you were surveyed to the alternate site? ______ **miles one-way**

20. For the kind of recreation you like to do, how many other sites besides the river where you were surveyed are available to you? ______ **other sites**

21. Typically, how many recreation trips per year do you take to central Idaho? ______ **trips per year**

22. What is your age? Circle one ... **{less than 20} {20-25} {25-30} {30-35} {35-40} {40-45} {45-50} {50-55} {55-60} {60-65} {65-70} {70-75} {75-80}**

23. Circle one ... Do you give up wage or salary income (i.e. non-paid vacation) when traveling to this site or while recreating at the site? {yes} {no}

25. If the answer is yes to question 24 above, how much income do you give up for a typical recreation trip to the river where you were surveyed? **$**______________

26. What is your current wage or salary income in $ per year? Circle one ...
{0-10,000} {10,000-20,000} {20,000-30,000} {30,000-40,000} {40,000-50,000} {50,000-60,000} {60,000-70,000} {70,000-80,000} {over 80,000}

27. What is your current pension, interest income, etc., in $ per year? Circle one ...
{0-10,000} {10,000-20,000} {20,000-30,000} {30,000-40,000} {40,000-50,000} {50,000-60,000} {60,000-70,000} {70,000-80,000} {over 80,000}

CENTRAL IDAHO OUTDOOR RECREATION SURVEY OMB # 0710-0001
Expires 9/30/1998

General Information Questions

1. What is your ZIP code? ________

2. What was the year of your most recent recreation trip to the Central Idaho region? 19 ___

3. How many recreation trips to the Central Idaho region did you take in the last 12 months? _______ trips

The remaining questions refer to the trip when your were contacted in Central Idaho and agreed to help with this survey.

4. What was your method of travel to the Central Idaho region? (Please check as many as apply)

< > Personal car/van/truck
< > Rented car/van/truck
< > Personal Camper/RV
< > Rented Camper/Mobile Home/RV
< > Airplane
< > Bus
< > Tour Bus
< > Tour Boat
< > Other, (describe) ________________________________

5. How many nights were you away from home on this trip? ______ nights
6. When you left home what was your primary destination? ____
7. How many miles did you travel (one-way) from your home to your recreation site in Central Idaho? _______ miles
8. How many people were in your travel group? _______ persons
9. What recreation activities were important to you and your group on this trip?

Please rank each activity 1 to 5, where 1 is very important and 5 is not important.

< > steelhead fishing
< > smallmouth bass fishing
< > trout fishing
< > sturgeon fishing
< > bull trout fishing
< > jet boating
< > camping
< > other, describe ____________________
< > rafting
< > kayaking
< > canoeing
< > hiking
< > bird watching
< > wildlife watching
< > sightseeing
< > biking
< > nature viewing

<

A map is enclosed that shows the Central Idaho region. Please use the map to identify local stopping points on your trip when answering the questions on the following pages.

10. Expenditures made by your group while **traveling to the Central Idaho recreation site**.

Type of Business	Dollar Amount	Name of Town or Nearest Major Town
County Government permits/licenses/fees		
State Government permits/licenses/fees		
Federal Government permits/licenses/fees		
Bus or Taxi Service		
Tour Boat		
Airline		
Car, P.U. or RV Rental		
Service Station (1)		
Service Station (2)		
Food Store		
Auto Dealer		
Clothing Store		
Boat/Marine Store		
Sporting Goods Store		
Hardware Store		
Restaurant		
Dept. Store		
Other Retail (describe)		
Motels & Lodging		
Guide Services		
Equipment Rental		
Parking and Car Wash		
Auto Repair		
Other Repair (describe)		
Entertainment		
Health Services		
Other (describe)		
Other (describe)		

Please make your best estimate for each category, enter zero if no expenditure.

11. Expenditures made by your group while **at the Central Idaho recreation site**.

Type of Business	Dollar Amount	Name of Town or Nearest Major Town
County Government permits/licenses/fees		
State Government permits/licenses/fees		
Federal Government permits/licenses/fees		
Bus or Taxi Service		
Tour Boat		
Airline		
Car, P.U. or RV Rental		
Service Station (1)		
Service Station (2)		
Food Store		
Auto Dealer		
Clothing Store		
Boat/Marine Store		
Sporting Goods Store		
Hardware Store		
Restaurant		
Dept. Store		
Other Retail (describe)		
Motels & Lodging		
Guide Services		
Equipment Rental		
Parking and Car Wash		
Auto Repair		
Other Repair (describe)		
Entertainment		
Health Services		
Other (describe)		
Other (describe)		

Please make your best estimate for each category, enter zero if no expenditure.

12. Expenditures made by your group **on the return trip back home**.

Type of Business	Dollar Amount	Name of Town or Nearest Major Town
County Government permits/licenses/fees		
State Government permits/licenses/fees		
Federal Government permits/licenses/fees		
Bus or Taxi Service		
Tour Boat		
Airline		
Car, P.U. or RV Rental		
Service Station (1)		
Service Station (2)		
Food Store		
Auto Dealer		
Clothing Store		
Boat/Marine Store		
Sporting Goods Store		
Hardware Store		
Restaurant		
Dept. Store		
Other Retail (describe)		
Motels & Lodging		
Guide Services		
Equipment Rental		
Parking and Car Wash		
Auto Repair		
Other Repair (describe)		
Entertainment		
Health Services		
Other (describe)		
Other (describe)		

Please make your best estimate for each category, enter zero if no expenditure.