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Estimating Revenue-Capture Potential Associated with Public Area Recreation

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A traditional contingent valuation approach and the "trip response method" were examined as potential techniques for measuring public area recreation revenue-capture potential. Empirical results suggest that both methods are useful for assessing revenue-capture potential. Additional research on alternative methods for assessing recreation revenue-capture potential is encouraged.

Key words: nonmarket valuation, public land management, resource economics.

Introduction

As a result of increased recreational demand and reduced management budgets, public resource management agencies are taking longer looks at the revenue-capture potential of recreational areas and facilities. This article focuses on developing techniques for measuring revenue-capture potential via alternative user fee mechanisms. The article opens with a conceptual background of willingness to pay, consumer surplus, and revenue capture. An empirical case study is then presented including model specifications, data collection procedures, and estimation results. General implications of this research are discussed last.

Conceptual Background

Revenue Capture

Revenue capture by a resource management agency implies acquiring funds from consumers/users. The focus of this article is on potential revenue capture from recreational consumers/users of public lands (e.g., national forests). In most cases, additional funds are gained by raising the price of using a recreational site or instituting a different fee structure. The general objective of changing prices or fee structures is to obtain or "capture" more of the recreational users' consumer surplus.

Referring to figure 1, at trip quantity level Q_1 and price level P_1, consumer surplus is equal to the area P_1ac. Revenues accruing to the managing agency are equal to the area P_1cfT. This area is the rectangle with edges bounding T (out-of-pocket travel expenditures) and P_1 (total trip expenditures). The current site use fee equals $P_1 - T$.

Raising the site use fee to $(P_2 - T)$ reduces consumer's surplus to the triangle P_2ab. A large portion of the lost consumer's surplus (P_2bcP_1) is captured by the managing agency in the form of additional revenues equal to area P_2beP_1. However, the agency also loses revenues equal to area $ecfg$ because of the trip decrease from Q_1 to Q_2.

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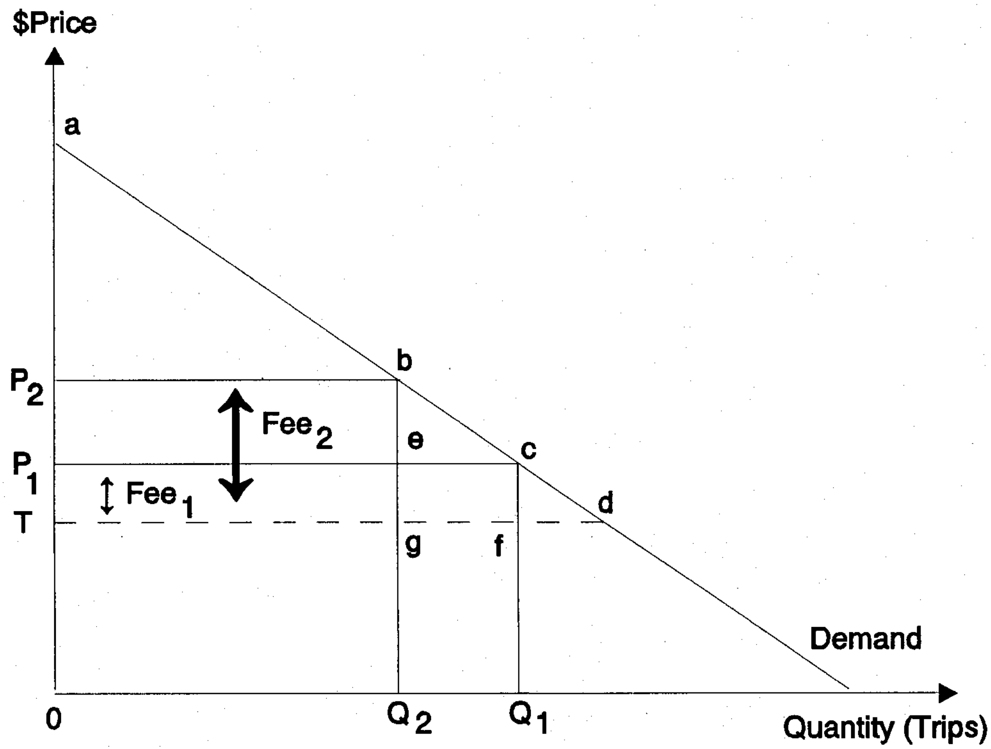

Figure 1. Increasing existing fee amounts

The total revenue received by the agency at the higher site use fee is equal to the area P_2bgT. Note that the small triangle *bce* is not captured with the increase in fees. This area is termed deadweight loss and is, as the name implies, lost to both the managing agency and consumer when price is raised to P_2. While this deadweight loss is important in social welfare considerations, as long as the gain in revenues (P_2beP_1) is greater than the loss (*ecfg*), increasing the site use fee will increase revenues at a site. When increasing site use fees decrease total revenues, the site or area has moved into a different elasticity portion of the demand curve. Revenue can be collected by any number of methods. Daily admission passes, vehicle admission fees, hotel taxes, local guide services, and the establishment of special funds for maintenance of recreational areas are a few possible strategies for revenue capture (Price; Walsh; Loomis and Thomas).

In order to assess revenue-capture potential under different payment strategies, some general tools must be available for estimating consumer surplus, or willingness to pay (WTP), associated with recreation trips. One such tool is a bid probability function, estimated using the contingent valuation method. Another such tool is a site demand function, estimated by using what is termed in this article as the trip response method. A few other studies were found in the search of literature that have used methods somewhat similar to the one presented here (see Loomis; Ward). In the case of Loomis' article, there was no estimation of demand or valuation included. Ward's study was very similar but performed no revenue-capture simulations.

Bid Probability Estimation Using the Contingent Valuation Method (CVM)

The specific form of the contingent valuation method used in this study was the dichotomous choice approach (DCA). This technique was first used by Bishop and Heberlein in 1979 in the valuation of "extra" market goods (e.g., environmental amenities). The technique subsequently has been developed and expanded upon to value a variety of nonmarketed goods (Cameron; Sellar, Chavas, and Stoll; McConnell; Bowker and Stoll; Hanemann). The application of this technique involves the construction of a hypothetical market or referendum (like any other CVM application) where respondents are asked to answer "yes" or "no" to a single dollar amount or posted price. The strength of the DCA is its simplistic nature and ease of implementation in a survey format. The closed-ended format is also argued to be more "market like" in that respondents can either "take it or leave it." Respondents likely are more accustomed to seeing market decisions in this format (McConnell).

As many authors have argued, valuation measures attained through contingent valuation studies have both theoretical validity and consistency with market demand-based values (Cummings, Brookshire, and Schulze; Bergstrom; Walsh). The ability of the CVM technique to provide estimates of willingness to pay makes it a very useful tool to employ for the valuation of recreation. Managers of recreation resources can use these values as a base for funding plans as well as implementing charging schemes.

Let a consumer's underlying utility function be specified as:

$$U_i = U_i(G_j, V_j, Q_j \mid S), \tag{1}$$

where G_j = market commodity j ($j = 1, \ldots, n$); V_j = recreation trip j ($j = 1, \ldots, m$); Q_j = quality of jth recreational trip; and S = vector of socioeconomic characteristics.

The consumer's budget constraint is given by:

$$M_i \geq P_jG_j + C_jV_j, \tag{2}$$

where M_i = consumer's annual monetary income, P_j = price or cost of market commodities, and C_j = price or cost of recreational trips. We assume that the budget constraint accounts for the opportunity cost of time involved in obtaining G_j or V_j. For regular market commodities, the opportunity cost of time involved in obtaining the commodity (e.g., travel costs to the local hardware store) are relatively low and usually ignored. In the case of recreational trips, however, the opportunity cost of time (e.g., travel costs to a national forest recreation site) are relatively high and therefore cannot be ignored.

The solution to the consumer's problem of maximizing (1) with respect to (2) is an indirect utility function of the form:

$$V_i = V_i(P_j, C_j, Q_j, M_i \mid S). \tag{3}$$

Equation (3) can be used to model the probability that a consumer is willing to pay a new user fee (F_j) associated with recreation trips. The consumer will pay the given fee (F_j) if:

$$V_i(P_j, C_j, + F_j, Q_j, M_i) > V_i(P_j, C_j^*, Q_j, M_i), \tag{4}$$

where C_j^* is the "choke" price for recreation trips (implying no access).

Following Hanemann, the probability that a consumer is willing to pay F_j can be specified generally by:

$$\text{PROB} = f(\Delta U), \tag{5}$$

where PROB is the probability that a consumer is willing to pay a given fee, F_j, and $\Delta U = V_i(P_j, C_j + F_j, Q_j, M_i \mid S) - V_i(P_j, C_j^*, Q_j, M_i \mid S)$. Mean willingness to pay can be estimated from equation (5) using procedures established by Hanemann or Cameron.

Site Demand Function Estimation Using the Trip Response Method

In addition to the bid probability function, another useful tool for the resource manager would be a site demand function which shows the relationship between user fees and trips demanded. Such a demand function would allow managers to estimate changes in visitation, revenue-capture potential, revenues collected as a result of different fee structures, and demand elasticities (Mitchell and Carson; Sellar, Chavas, and Stoll; McConnell; Cameron). In traditional travel cost method (TCM) studies, this site demand function is estimated *indirectly* from a "first-stage" demand function for trips, and is termed the "second-stage" demand function (Walsh).

In this study, the trip response method (TRM) was used to *directly* estimate the "second-stage" site demand function. In the TRM, survey respondents are given a hypothetical user fee amount and asked to state how many trips they would make to the site at that fee amount. Fee amounts are varied across the sample to obtain the data necessary for econometrically estimating a site demand function.

The theoretical basis for the TRM parallels the traditional travel cost method. In this study, the underlying utility function and budget constraint for individual i for the TRM are also given by (1) and (2), with the same solution for the indirect utility function given by (3). Using Roy's Identity, the consumer's Marshallian demand function for recreation trips can be derived from (3) and expressed in general form as:

$$V_i = f(C_j, M_i, S), \tag{6}$$

where all variables are as defined previously. Equation (6) gives the consumer's "first-stage" demand function as defined in traditional travel cost literature (e.g., see Ward and Loomis). The total number of trips a consumer would take if the cost of trips increased by a given user fee (F_j) is given by:

$$V_i = f(C_j + F_j, M_i, S). \tag{7}$$

The data generated by substituting various values for F_j into (7) and solving for total trips can be used to drive the consumer's "second-stage" demand function:

$$V_i = f(F_j, M_i, S). \tag{8}$$

The "second-stage" demand functions show the number of trips a consumer is expected to take to a site given "added costs" for a trip, such as increased user fees (Ward and Loomis). Mean WTP estimates, both the consumers' surplus approximation and the more exact compensating variation measure, can be calculated from (8) following procedures found in LaFrance, or LaFrance and Hanemann.

Empirical Case Study

Study Area, Design, and Procedures

The general study area for our empirical case study was in two national forests in the southeast, the Cherokee (CK) and the George Washington (GW), in the Ocoee and Warm Springs districts, respectively. CK and GW forest managers are interested in information concerning revenue-capture potential associated with recreation fees. The issue has come to the forefront as a result of increased opposition to below-cost timber sales and the desire to explore alternative revenue sources.

A questionnaire was designed to collect the data necessary for estimating a CVM-based bid probability function, and a TRM-based site demand function. The CVM valuation question used the dichotomous-choice approach with an annual vehicle pass as the bid vehicle. The annual vehicle pass would allow everyone in a vehicle to use sites in the district throughout the year. Respondents were asked to reply "yes" or "no" to a specific fee (annual pass) amount, with the assumption that a "no" response would preclude them from recreating in the district in question. The TRM valuation question asked for the number of trips the respondent would take to a specific site in a district, given a daily, *per person* admission fee.

Both questions were asked on-site in face-to-face interviews and were included as part of a larger survey obtaining use, satisfaction, and demographic information. Interviewers were instructed to be completely neutral in delivery and to give a minimum of extraneous information concerning the question. In order to gain more complete knowledge of their

Table 1. Definitions of Variables Used in the Bid Probability Function Modeling and TRM Modeling

Variable	Variable Definition
Quality/Perceptions:	
SFAVOR	Rating of the site as a favorite place to recreate
LSFAVOR	Natural log of *SFAVOR*
Information:	
AGEEXP	A ratio of *SITEEXP/AAGEINT* (ratio takes years of experience with the specific forest district and divides by the age of the respondent)
LAGEEXP	Natural log of *AGEEXP*
NUMBER	Number in household
LNUMBER	Natural log of *NUMBER*
Preferences:	
INCOME	Annual household income
LINCOME	Natural log of *INCOME*
Substitutes:	
DUMMY	A 0, 1 dummy variable designed to represent whether the respondent had listed a substitute site
National Forests:	
FOREST	A 0, 1 dummy variable designed to designate one forest from the other

stay, interviews were conducted only with those recreationists who were leaving the area. The CVM and TRM valuation questions are reproduced in the appendix.

Model Specification

In order to estimate a bid probability function from the dichotomous-choice CVM data, a logit function was specified (9) following procedures established by Hanemann, and Sellar, Chavas, and Stoll:

$$Y = \frac{1}{1 + e^{(-\Delta U)}}, \tag{9}$$

where $Y = 1$ if a respondent (representing the group in the vehicle) answered "yes" to the valuation question, and $Y = 0$ if he or she answered "no." In (9), ΔU was approximated by:

$$\Delta U = \alpha + \beta_1 LBID + \beta_2 LAGEEXP + \beta_3 LNUMBER + \beta_4 LINCOME + \beta_5 LSFAVOR + \beta_6 FOREST, \tag{10}$$

where *LBID* is the natural log of the price of the annual vehicle pass. Other independent variables are defined in table 1. Expected values of PROB were attained using the normalization procedure suggested by Boyle, Welsh, and Bishop.

The TRM model was specified as:

$$\log Q = \alpha + \gamma_1 BID + \gamma_2 AGEEXP + \gamma_3 NUMBER + \gamma_4 INCOME + \gamma_5 SFAVOR + \gamma_6 FOREST + \gamma_7 DUMMY, \tag{11}$$

where $\log Q$ is the natural log of the number of trips a respondent reported he or she would take at the daily admission fee denoted by *BID*. Previous studies suggest that a theoretically appropriate and empirically strong functional form for TCM demand equations is a log-dependent form (Ziemer, Musser, and Hill). This functional form was therefore selected for (11). Other independent variables are defined in table 1.

Table 2. Resulting Numbers of Observations Used in Estimation After Protest Bid Culling Procedure

Data Set No.	Model	
	TRM	CVM
1	770 (100%)	768 (100%)
2	769 (99.7%)	768 (99.7%)
3	561 (65.2%)	682 (64.3%)

Note: Numbers in parentheses represent percentage of original observations.

Protest Bids

A common practice in CVM studies is to identify and eliminate respondents suspected of being "protest bidders" (Cummings, Brookshire, and Schulze; Boyle and Bishop; Reiling et al.). In our survey, respondents who refused to pay the stated user fee for recreation (annual vehicle pass or daily admission fee) were asked to give a reason. Protest bidders were considered to be those who responded that they "objected to these types of questions" or who stated that the valuation question was "unclear to them." In either case, refusal to pay the stated user fee does not appear to reflect the respondent's true valuation of recreational access.

In order to assess the sensitivity of the model estimation results to the elimination of protest bids, (10) and (11) were estimated using three separate data sets. The first (data set 1) used all observations without adjustment for protest bids. The second (data set 2) eliminated all observations where the respondents stated that they "objected to these types of questions." The third (data set 3) eliminated both those respondents who "objected to these types of questions" and those who stated that the question was "unclear to them."

Table 2 shows the number of observations for each of the above data sets. The numbers

Table 3. Model Results: Site Demand Function (TRM-based)

TRM Model No.	Variables						
	BID	*AGEEXP*	*BHHNUMBER*	*INCOME*	*SFAVOR*	*FOREST*	*DUMMY*
1	Data Set 1						
	−.2495*	−.0531	−.2293**	.000012**	.0049	.3653***	.2281
	(−9.777)	(−.140)	(−2.570)	(2.578)	(.116)	(1.535)	(.963)
	.0255	.38	.0892	.000005	.0427	.2379	.2369
	$N = 770$; Pseudo $R^2 = .24$						
2	Data Set 2						
	−.2491*	−.0429	−.2323*	.000012**	.0064	.369	.2228
	(−9.776)	(−.113)	(−2.60)	(2.556)	(.015)	(1.552)	(.941)
	.0255	.3801	.0893	.000005	.0428	.2378	.2368
	$N = 769$; Pseudo $R^2 = .24$						
3	Data Set 3						
	−.221*	.048	−.2107**	.000011**	.0722***	.1594	.2829
	(−9.887)	(.135)	(−2.479)	(2.445)	(1.754)	(.708)	(1.255)
	.0224	.3549	.085	.000004	.0412	.2251	.2254
	$N = 561$; Pseudo $R^2 = .29$						

Notes: t-values are in parentheses below parameter estimates; standard errors are reported below t-values. Single, double, and triple asterisks (*) indicate significance at the .01, .05, and .10 levels, respectively.

Table 4. Model Results: Bid Probability Function (CVM-based)

CVM Model No.	*LBID*	*LAGEEXP*	*LNUMBER*	*LINCOME*	*LSFAVOR*	*FOREST*
1	Data Set 1					
	−.9318*	−.0147	−.1089	−.0295	1.5256*	.1696
	(−13.325)	(−.184)	(−.584)	(−.347)	(3.769)	(.955)
	.0699	.0798	.1865	.0849	.4048	.1777
	N = 768; McFadden R^2 = .26					
2	Data Set 2					
	−.9318*	−.0147	−.1089	−.0295	1.5256*	.1696
	(−13.325)	(−.184)	(−.584)	(−.347)	(3.769)	(.955)
	.0699	.0798	.1865	.0849	.4048	.1777
	N = 768; McFadden R^2 = .26					
3	Data Set 3					
	−.9903*	.0622	−.0778	.029	1.5501*	−.0005
	(−12.618)	(.723)	(−.383)	(.311)	(3.485)	(−.002)
	.0785	.0859	.2031	.0931	.4447	.1942
	N = 682; McFadden R^2 = .27					

Notes: t-values are in parentheses below parameter estimates; standard errors are reported below t-values. An asterisk (*) represents significance at the .01 level.

in parentheses below the total for each data set represent the percentage of observations left after protest bid elimination. As shown, the number of observations in data sets 1 and 2 were very close. The largest drop in observations for both methods occurred with data set 3, which included the elimination of respondents who said the valuation question was "unclear to them."

Estimation Results

The model estimation results achieved with each of the three different data sets described above are presented in tables 3 and 4. The TRM-based site demand function in (11) was estimated using TOBIT analysis.[1] The demand function results fit well with coefficient estimates having expected signs and fairly high levels of statistical significance. The logit function in (10) was estimated using logistic regression. All the estimated coefficients had expected signs. Only *LBID* and *LSFAVOR*, however, were statistically significant. The percent of values correctly predicted by this model was 77.3. Results of the third data set estimation procedure for both models were deemed to be "tighter" than the previous two. Therefore, for the purpose of the following applications, the third data set estimation results for each model were used.

All models displayed low R^2 values. This result seems to be in keeping with many CVM studies (Stevens et al.; Boyle and Bishop; Bergstrom et al.; Cordell and Bergstrom). Predictive power of the models was fairly high, however, as noted above.

Table 5. WTP Values for Each Forest by Data Set

	CVM	
Data Set No.	George Washington	Cherokee
1	$45.39	$50.04
2	45.39	50.04
3	55.14	55.12

Table 6. Consumer's Surplus and Compensating Variation Values for Each Forest by Data Set for TRM Estimation

Data Set No.	TRM			
	George Washington		Cherokee	
	CS	CV	CS	CV
1	$3.56	$3.67	$5.12	$5.33
2	3.30	3.29	4.78	4.76
3	7.69	7.72	9.02	9.06

WTP values for the logit model were calculated using the trapezoidal rule of integration under the estimated logit function. The results of this procedure for each forest are presented in table 5. WTP values for the TOBIT estimation (TRM) followed procedures suggested in LaFrance and Hanemann, and LaFrance. In addition to consumer's surplus estimates, compensating variation estimates were calculated for comparison purposes. These results for each forest are presented in table 6. Because compensating variation is an exact welfare measure and consumer's surplus is an approximation, one would expect the two values to be somewhat divergent. As the results in table 6 attest, the two values are very similar. The two measures are conceptually the same only if the income effects of the price change are zero (LaFrance and Hanemann). The TRM produced estimates of annual WTP for a site, and the CVM produced estimates of annual WTP for a district.

Elimination of protest bids did little to change valuation results. In all cases, WTP rose slightly (due, in part, to the omission of zero responses). Estimation results over both logit and TOBIT procedures "tightened" (i.e., significance levels rose and standard errors decreased for the TOBIT results) and explanatory power rose.

Revenue-Capture Potential

The overall purpose of this research was to provide the U.S. Forest Service with information about techniques for assessing total revenue-capture potential, and to suggest specific fee collection strategies which might be used to capture some of this revenue. As with most state and federal agencies, budgets are being cut and spending for specific areas is being examined scrutinously. Many of the recreation opportunities provided by the Forest Service (e.g., camping areas, hiking trails, lake beach areas, picnic areas, etc.) are provided at little or no cost to the user. As a result, these opportunities are financed by general tax revenues and not by those who use the resources directly. As budgets have tightened and opposing uses have been questioned (i.e., timber production vs. recreation), Forest Service managers have become more interested in the potential of recreation to at least be self-supporting.

The estimated site demand function was applied to assess revenue-capture potential using a daily admission fee. The estimated bid probability function was applied to assess revenue-capture potential using an annual vehicle pass. The use of these techniques to assess revenue-capture potential is demonstrated below through an application to hypothetical visitor use data for the Warm Springs district of the GW National Forest.

Annual District Vehicle Pass. The CVM results were first used to estimate the levels of participation in table 7. Specifically, for the GW National Forest, means were calculated for all of the variables in (10) except *LBID*. Multiplying these variable means by their corresponding model coefficient and then summing produces a constant term which can be inserted into equation (12), which was specified as:

$$Z = \frac{1}{1 + e^{-(\alpha + \beta_1 \ln(F))}}, \tag{12}$$

where Z is the probability that a *typical* group is willing to pay the annual vehicle pass,

Table 7. Example of Probability of Typical Groups Being Willing to Pay Fee Price for the District

Annual Vehicle Fee Price ($)	Groups Willing to Pay Fee (%)
1	96.1
2	92.5
5	83.1
7.5	72.5
10	70.4
15	60.5
25	46.1
45	28.6
65	18.4
85	11.7
110	5.9
150	0

α is the composite constant term, β_1 is the coefficient on the fee variable, and $\ln(F)$ is the logged fee amount. Equation (12) is a reduced version of (9). Plugging in values for F and solving produced estimates of Z at various fee amounts. Table 7 shows the differing probabilities of a typical group being willing to pay for an annual vehicle pass as estimated by (12) for the GW National Forest.

The total revenue-capture potential for the district then can be estimated by the equation:

$$REVENUE = FEE \times Z \times G, \tag{13}$$

where $REVENUE$ = revenue for district, FEE = proposed annual fee, Z = probability that typical group is willing to pay fee (see table 7), and G = estimate of annual number of groups currently visiting the district.

In equation (13) above, G can be estimated by dividing an estimate of annual group visits (e.g., vehicle counts) by an estimate of annual visits per group (for example, 7). As an exercise, consider the following example. With an annual vehicle count of 200,000 (V), G is 28,571 (200,000/7 = 28,571). Therefore, using equation (13) in conjunction with the percentages found in table 7, we can estimate possible revenue-capture amounts at

Table 8. Example of Estimated Revenue-Capture Potential for Annual Vehicle Pass

Annual Fee ($)		Percent of Groups Willing to Pay Fee		No. of Groups Currently Visiting the District		Annual Revenue ($)
FEE	×	*P*	×	*G*	=	*REVENUE*
1		96.1		28,571		27,457
2		92.5		28,571		52,856
5		83.1		28,571		118,712
7.5		72.5		28,571		115,355
10		70.4		28,571		201,140
15		60.5		28,571		259,282
25		46.1		28,571		329,281
45		28.6		28,571		367,709
65		18.4		28,571		341,709
85		11.7		28,571		284,139
110		5.9		28,571		185,425
150		0		28,571		0

Table 9. Example of Percentage Reduction in Annual Trips per Daily Fee Levels for the Site

Daily Fee Price Levels ($)	Reduction in Trips to Site (%)
1	96.1
1.5	92.5
2	83.1
3	72.5
5	70.4
7.5	60.5
10	46.1
12.5	28.6
15	18.4
20	11.7
25	5.9
35	0

varying fee rates. The results in table 8 suggest that district revenue would be maximized by setting the annual vehicle fee at about $45 per year.

Daily Site Admission Fee. Unlike the annual vehicle pass, the daily site admission fee is a charge *per person* per trip. Thus, the fee explicitly increases the price per trip paid by each visitor. Demand theory suggests that as the price per trip increases, trips demanded should decrease. Results of the TRM were used to estimate the percentage reduction in person visits. Equation (11) was evaluated using the means of each variable multiplied by their corresponding coefficient. This resulted in the constant term R which represents the percentage reduction in visits for a typical visitor. Table 9 shows the percentage reduction in person visits to *sites* which would be caused by various daily admission fees.

Total revenue-capture potential for a particular site then can be estimated by:

$$REVENUE = FEE \times (1 - R) \times V, \tag{14}$$

where $REVENUE$ = revenue for a site, FEE = proposed daily admission fee, R = percentage reduction in person visits at each fee level (see table 9), and V = estimate of current annual person visits to site (or number of group visits × persons per group).

Again, as an exercise, consider the example below. With annual visitation of 100,000

Table 10. Example of Estimated Revenue-Capture Potential for the Daily Admission Fee

Daily Fee ($)		Percent of Original Trips to Site		Current Visitation to the Site		Estimated Annual Revenue ($)
FEE	×	(1 − *R*)	×	*V*	=	*REVENUE*
1		.802		100,000		80,200
1.5		.718		100,000		107,700
2		.645		100,000		129,800
3		.515		100,000		154,500
5		.333		100,000		166,500
7.5		.192		100,000		144,000
10		.109		100,000		109,000
12.5		.062		100,000		77,500
15		.036		100,000		54,800
20		.01		100,000		20,000
25		.005		100,000		12,500
35		.0004		100,000		1,400

to a site (V) and reductions in number of trips by fee charged (R), as listed in table 9, we obtain the results shown in table 10. Note in table 10 that revenue would be maximized at a daily site admission fee of about $5 per person.

Implications

Clearly, the two revenue-capture strategies can produce differing amounts of revenue potential. Using pure revenue-capture maximization as the decision rule in our GW National Forest example, the annual vehicle pass would be set at $45 and the daily admission pass at $5. However, managers may be constrained legally by the amounts they can charge or by equity considerations. Setting a daily admission pass of $5 would price an estimated 67% of trips by current users out of the market. This result may not be desirable from an equity (or public relations) standpoint, especially considering that a national forest is publicly owned. On the other hand, the annual vehicle pass would reduce groups using the forest district by 71%. Visitation objectives and guidelines under which managers operate will affect the revenue-capture strategy at a particular recreation site or area.

The large estimated reduction of use seen from instituting fees might be explained in several ways. One could be that there are currently no entry fees in place, outside of developed camping sites, at either of the areas. Thus, instituting a fee where previously there was none creates resistance to that institution, possibly in the form of lower numbers of trips.[2] Also, because there are no current fees, the reaction of users to the initiation of a fee could be causing the high elasticity responses we see. Demand response might not be as elastic if there were some type of fee structure already in place.

The fact that expected visitation appears sensitive to the type of fee payment scheme used is not a surprising result. For example, respondents may take as many trips after a lump sum payment, such as an annual vehicle pass, as they would have taken without one. Arguments against this hypothesis consider that respondents may amortize the lump sum payment over a year's trips and adjust trips accordingly. A daily pass results in an explicit increase in the price per trip, which in turn causes recreationists to adjust trips downward.

The differences between the two models also may be due to payment vehicle problems. Previous studies demonstrate that the type of payment vehicle used can influence valuation behavior and results (Bergstrom and Stoll; Rowe and Chestnut; Schulze, d'Arge, and Brookshire). Different payment vehicles (e.g., entrance fees vs. increased taxes) may induce varying levels of protest bidding which can affect values derived from contingent valuation studies. Payment vehicle effects also may occur in the valuation estimation without being manifested in protest bidding. For example, if taxes are used, a respondent may quote a "low" WTP; this may be because the respondent thinks taxes are already too high, not necessarily that the resource in question has low value (Peterson et al.).

It was conjectured that a TRM approach may provide a more neutral means of asking revenue-capture questions in a survey format. One reason is that the framing of the question is more "market-like" in that respondents are given a price and asked for the quantity of trips they would consume. Also, TRM respondents are not asked to place dollar values on resources directly. Rather, they express it indirectly through the number of trips they indicate they would take at a given price. The method still may be subject to certain potential contingent valuation type biases (e.g., hypothetical bias and/or strategic behavior), but may reduce the effect of other biases such as payment vehicle and starting point bias. More research is needed, however, before any firm conclusions can be drawn regarding the relative merits of traditional CVM questions where a consumer is given a fixed quantity of a commodity and asked to value the commodity, in contrast to TRM questions where a consumer is given a fixed price and asked to state the quantity he or she would "purchase" at that price. An interesting aspect of the trip response model is that the results (the second-stage demand curve) can be directly compared to estimation results of more traditional travel cost studies. This may lend itself to a kind of check for both methods in comparing their respective resulting values. The estimated demand curve also can produce estimates of elasticity which can be of help to recreation managers in the pricing of a recreation area. Analyzing data with both methods (TRM and traditional CVM) could make for interesting and useful future research.

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Notes

[1] TOBIT analysis was used to handle the large proportion of legitimate "zero" observations reported for the dependent variable.

[2] Here we are not talking about protest bidders as traditionally defined; rather, we speak of those who report a lower number of trips purposely because they are resisting the institution of fees.

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Appendix

CVM Question

Suppose a type of pass was offered allowing you (and anyone in your vehicle) to visit any area operated by this agency in (location) for one year. This pass would not cover camping fees. The money from the fee would be used to maintain these areas in their present condition, but there would be no improvements. If the price of this year's annual was $________, would you have bought one?

[ ] Yes If that fee were charged, about how many days would you use the site over the next 12 months?
______ days

[ ] No If "No," then go to reasons below
- [ ] We do not visit (location) enough to justify buying a pass
- [ ] There are many other areas to visit besides (location)
- [ ] We cannot afford to buy the pass
- [ ] Question was not clear to me
- [ ] I do not believe fees should be charged
- [ ] Some other reason (specify) ________________

TRM Question

Suppose the agency managing this site started charging a daily admission fee of $________/person. The money from the fee would be used to maintain the site in its present condition, but there would be no improvements. This fee would not cover camping fees. Would you continue to use the site?

[ ] Yes If that fee were charged, about how many days would you use the site over the next 12 months?
______ days

[ ] No If "No," then go to reasons below
- [ ] I do not visit this site enough to justify buying a pass
- [ ] There are many other sites to visit besides this one
- [ ] I cannot afford to buy the pass
- [ ] Question was not clear to me
- [ ] I do not believe fees should be charged
- [ ] Some other reason (specify) ________________