Articles

The Role of Expectations and Heterogeneous Preferences for Congestion in the Valuation of Recreation Benefits

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Studies of recreation congestion generally utilize nonmarket valuation techniques to determine the use level and entrance price that maximize aggregate recreation benefits for a specific recreation area. This paper improves upon these previous studies by relaxing the assumption of homogeneous preferences among visitors of the same recreation area and accounting for visitor expectations of congestion. The results indicate that failing to account for heterogeneous preferences for congestion by time of visit leads to overestimates of the benefits of relieving peak-time congestion, while accounting for expectations raises questions about the validity of the standard optimal use model.

Managers facing excess demand for a recreation site have four basic management options: (1) to do nothing and allow congestion to occur at the site; (2) to ration entry and hence use of the site through means other than price; (3) to increase the entrance price to eliminate excess demand; (4) to increase recreation capacity to accommodate more visitors. These options in turn raise three fundamental policy questions: (1) What is the optimal use level of a recreation facility? (2) What entrance price would be necessary to eliminate excess demand for a congested recreation area? (3) What are the costs and benefits of doing nothing or of expanding recreational capacity? In light of increasing demand at existing recreational facilities and growing acceptance of user fees for public recreation, these questions are of increasing importance.

Beginning with the work of Fisher and Krutilla (1972) and Cichetti and Smith (1973, 1976), economists have attempted to answer these questions through the use of nonmarket valuation techniques. This paper attempts to improve upon these previous studies and to show how relaxing the assumption of homogeneous preferences among visitors of the same recreation area and accounting for visitor expectations lead to more accurate estimates of the benefits of relieving recreation congestion. Specifically, the empirical analysis of this paper has two objectives: (1) to examine the relative impacts of the actual experience versus pretrip expectations of congestion on willingness to pay, and (2) to test the hypothesis that peak (weekend and holiday) and nonpeak wilderness visitors exhibit heterogeneous preferences for congestion. If peak period users are less averse to congestion than are nonpeak visitors, optimal use levels and user fees estimated under the assumption of homogeneous preferences will be inefficient.

Related Literature on Recreation Congestion

In general, economic studies of recreation congestion show that unregulated levels of use are inefficient, and focus on developing empirical techniques that determine the optimal level of use. Fisher and Krutilla were among the first to define the problem:

> As long as the gain from admitting additional numbers exceeds the loss due to congestion costs, aggregate net benefits will increase. Beyond a point the congestion costs exceed the gains experienced by the additional recreationists and total net benefits diminish. . . . Optimal capacity is the point at which the

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> total benefit is a maximum and the incremental or marginal benefit is zero. (1972, pp. 423–25)

Fisher and Krutilla went on to develop a model in which congestion is viewed as a quality attribute of a recreation experience and is included in a willingness to pay function along with socioeconomic variables and other quality attributes.

Cichetti and Smith (1973, 1976) were the first to use the contingent valuation approach to measure the effect of congestion on willingness to pay. Several subsequent studies have used variations of this model to estimate willingness to pay functions in which congestion has a significant negative effect on the benefits of various types of outdoor recreation (McConnell 1977; Walsh and Gilliam 1982; Walsh, Miller, and Gilliam 1983; Prince and Ahmed 1988; Berrens, Bergland, and Adams 1993).

McConnell and Sutinen (1984), Menz and Mullen (1981), and Prince and Ahmed (1988) have all focused on the impact of expected levels of congestion on willingness to pay. McConnell and Sutinen point out one of the problems of estimating willingness to pay from specific experience or actual conditions is the failure to model the role of prior expectations when the user faces uncertainty about congestion. They note the role of congestion in bringing about "equilibrium" in outdoor recreation. "Equilibrium," as defined by McConnell and Sutinen (1984, p. 12), "is not equality of quantity supplied and demanded at the going price. Rather, it involves the equality of expected and realized (actual) congestion." Prince and Ahmed argue that unrealized expectations with regard to congestion cause some recreationists to adjust their length of visit. According to Prince and Ahmed's work, failing to account for the effect of expectations on length of stay will result in a downward bias in benefit estimates.

While the role of expectations in the valuation of recreation benefits has been the subject of significant research, there has been little research regarding the impact of heterogeneous preferences on benefit estimation. McConnell (1988) and Freeman and Havemann (1977) have analyzed the effect of heterogeneous preferences between different income groups. Both McConnell's and Freeman and Havemann's results show that heterogeneous preferences for congestion will not change the optimal level of use but will require a higher fee to reach it than under the assumption of homogeneous preferences. To show the distributional effects of changes to recreational prices and congestion, they recommend allowing the price and congestion coefficients of willingness to pay models to vary with income.

A theoretical paper by Smith (1981) determined that heterogeneous preferences by time of visit would affect benefit estimates derived from a travel cost model. However, this paper appears to be the first empirical study to test for heterogeneous preferences for congestion by time of visit by allowing the congestion coefficients to vary by weekend and weekday users.

Management Implications of Heterogeneous Preferences

Contingent valuation studies of recreation benefits go to great effort to ensure a "representative sample" by surveying recreationists on a random sample of potential visitation days. This sampling scheme suggests that researchers believe that recreationists are heterogeneous by time of visit, yet their estimates of willingness to pay assume that consumers are homogeneous with respect to time of visit (Prince and Ahmed 1988; Walsh, Miller, and Gilliam 1983). If nonpeak visitors are choosing their time of visit to avoid congested conditions, it is reasonable to believe that their willingness to pay to avoid congestion is greater than that of peak visitors. If the peak visitors are willing to pay less to avoid congestion, assuming homogeneous preferences causes the benefits of relieving congestion during peak periods to be overestimated and the optimal level of peak season visitation to be underestimated.

A simple example illustrates the point. Suppose a popular wilderness hiking area averages thirty hiking groups per day on summer weekends and only ten groups per day during the week. Concerned about weekend congestion in the area, the area's managers request an economic study of the problem. Using standard recreation congestion models and nonmarket valuation techniques, the researchers determine that beyond twenty groups per day, the congestion costs of additional groups are greater than the benefits they receive. Following the advice of economists, the recreation managers try to reduce weekend use either by increasing weekend entrance fees or by implementing a permit or quota system; many previous weekend visitors respond by substituting weekday trips when use levels are below the "optimal level" of twenty groups. Because the original researchers assumed homogeneous preferences for congestion among all the visitors they surveyed (both weekend and weekday), it appears as if economic benefits have increased. However, if the weekday visi-

tors have stronger preferences for solitude than weekend visitors, the optimal use level on weekdays is smaller than on weekends. Management policies that redistribute use from weekends to more lightly used weekdays could result in a reduction of benefits.

Measuring Recreation Congestion

Currently, the literature is inconclusive as to what is the correct or even a preferred measure of recreation congestion. Prior to an article by Shelby (1980), most research used objective measures of "actual" congestion such as visitor density or encounters and interactions between groups. Shelby demonstrated that density and interactions do not determine crowding. He defined crowding as occurring only when the level of interactions with others is evaluated as excessive by an individual: "Perception of an area as crowded may thus be more highly correlated with preferences and expectations than with actual encounters or density" (1980, p. 45).

A recent paper by Jakus and Shaw (1997) has a good discussion of alternative congestion measures. In addition to actual congestion, they define expected congestion, anticipated congestion (ex ante measures), and perceived congestion (ex post measure), and conclude that the appropriate measure depends upon the stage of the recreation decision process being modeled. In this study, we were constrained to ex post interviews of recreationists but also knew that information on ex ante expectations was important for the empirical model. Information on ex ante expectations was obtained by asking respondents whether or not the actual conditions they experienced met their expectations.

Specifically, the survey asked visitors of the Caribou–Speckled Mountain Wilderness (CSMW) to recall, immediately after leaving the wilderness, the specific number of encounters with other groups on their hike. In addition, respondents were asked whether various actual trip conditions were as they expected. Regarding congestion, the survey asked whether the number of encounters with other groups was more than, less than, or about the same as they expected. This specification of the expectations question is an improvement over surveys that ask for a numerical response to expectations of encounters because it does not ask too much of the respondent. An individual is not likely to have a specific answer to the number of expected encounters, and his/her ex post response is likely to be influenced by the response to the number of actual encounters. The question in the CSMW study is framed in a way that is easier for respondents, who can respond "more than expected" or "less than expected" in the cases where actual conditions were noticeably different from expectations, rather than testing respondents' ability to recall the specific magnitude of a pre-trip expectation.

The Study Area and Survey Procedures

The Caribou–Speckled Mountain Wilderness, established in 1990, is the only national forest wilderness area in the state of Maine. Originally designated as a backcountry hiking and camping area, the 12,000-acre CSMW is part of the White Mountain National Forest located in western Maine near the New Hampshire border. Most recreational trips to the CSMW are day visits, as less than 5% of visitors camp overnight in the wilderness area. Although recreational use of the area has never been as heavy as in other parts of the White Mountains, the CSMW still receives approximately 8,000 visits per year. The area is especially popular during the weekends in July and August (Reiling, Michael, and McLean 1994).

The source of data for this study is an on-site survey of noncommercial wilderness visitors (i.e., all visitors not led by paid guides). Drafts of the four-part questionnaire were pretested at the CSMW on two weekends in May, and revisions were made to reduce the interview time and to improve clarity. The actual survey was administered at the wilderness area trailheads as groups were leaving the area. The interviewer monitored the three main access points to the wilderness area on a random basis throughout the sampling period of June 15 to September 15, 1993.[1] As groups left the wilderness, the interviewer asked the "group leader" to complete the survey booklet while the remaining members of the group worked with the interviewer to identify the trails hiked by the group during their visit. The interviewer also answered any questions the group leader had about the survey booklet. This surveying technique was effective in allowing the interviewer to ensure accurate results while being able to administer two or three surveys simultaneously during busy periods. The interviewer approached every recreational (noncommercial) group leaving the wilderness and obtained completed surveys from 258 of 259 (99.6%) of the groups. Because of nonresponses to key variables, only 236 observations (91.1%) were usable for the willingness to pay models.

Characteristics of CSMW Visits and Visitors

Some highlights of the survey results are shown in table 1. The only characteristics that show significant differences between weekday and weekend visitors are related to congestion and visitor origin. Weekend visitors typically encounter twice as many groups, 5.28, as their weekday counterparts, 2.64. In addition, only 24% of weekend users reported seeing fewer groups than expected, while 41.3% of weekday users reported this to be the case. Seeing more groups than expected was less common, and especially rare among weekday users, only 6.4% (7 respondents) of whom encountered more groups than expected. Interestingly, the only other characteristic that is significantly different between weekend and weekday is the percentage of visitors who are Maine residents. Maine residents made up 51% of weekend users, and only 27.4% of weekday visitors.

To measure visitors' preferences for various wilderness attributes, respondents were presented with a list of ten factors or conditions that may contribute to a high-quality wilderness experience, such as the level of trail maintenance, seeing wildlife, and the presence of scenic views. Respondents ranked the factors on a three-point scale where a score of 1 is "very important," 2 represents "somewhat important," and 3 indicates the factor is "not at all important" to a high-quality wilderness experience. Weekday and weekend visitors had significantly different preferences for only one factor, seeing few other groups in the CSMW. If these heterogeneous preferences are replicated in the willingness to pay models, the coefficients on the congestion variables should show a greater willingness to pay to avoid congestion for weekday users than for weekend visitors.

While the survey did not directly ask respondents the number of encounters they expected with other groups, the statistics in table 2 indicate that weekday and weekend users expected different levels of congestion. The sample is divided into six groups based on their time of visit and whether the number of encounters was less than, more than, or about as expected, and gives the mean number of actual encounters for each group. The expected number of encounters is clearly lower for weekday users. The fact that weekday users expected fewer encounters and had a significantly higher preference for fewer encounters indicates that congestion-sensitive visitors may be choosing weekday visits to avoid congestion. This result lends support to the assumption of heterogeneous preferences for congestion among weekend and weekday users to be tested in the willingness to pay model.

Empirical Model and Estimation Results

In this study, dichotomous choice contingent valuation is used to measure an individual's willingness to pay for a visit to the Caribou–Speckled Mountain Wilderness. After asking in detail about their total trip expenses, the survey asked respondents a contingent valuation question: "Would you still have visited the CSMW if your expenses had been $(BID) more than the total you just calculated?" Respondents were presented with dollar amounts ($BID) ranging from $10 to $150, and their yes or no responses were used for the willingness to pay estimations. By asking respondents to recall their trip expenditures immediately before answering the contingent valuation question, the survey makes it clear how their expenses may change and places the magnitude of the change in a meaningful context. The part of the survey relevant for the contingent valuation analysis can be examined in the appendix. Table 3 contains simple

Table 1. Selected User Characteristics for Visitors

Characteristic	All Visitors	Weekday Visitors	Weekend Visitors
Mean number of encounters with other groups*	4.14 (.18)	2.64 (.18)	5.28 (.26)
Fewer encounters than expected (%)*	31.5 (2.9)	41.3 (4.7)	23.9 (3.6)
More encounters than expected (%)*	12.0 (2.1)	6.4 (2.4)	16.2 (3.1)
Mean income ($)	58,014 (2,268)	60,694 (3,283)	55,870 (3,124)
Maine residents (%)*	40.8 (3.1)	27.4 (4.2)	51.0 (4.2)
Importance of seeing few other groups to a high quality wilderness experience*	1.62[a] (.04)	1.52 (.06)	1.69 (.06)
Sample size	258	113	145

*Indicates the means for weekend and weekday visitors are significantly different at the 5% level for this characteristic.
[a]Mean value on a 3-point scale where 1 = very important, 2 = somewhat important, and 3 = not at all important.
NOTE: Numbers in parentheses represent standard errors.

Table 2. Average Number of Encounters by Expectations and Time of Visit

Day of visit	Fewer Encounters than Expected	Encounters about as Expected	More Encounters than Expected
Weekday	2.18 (.30) n = 45	2.96 (.23) n = 54	3.86 (.74) n = 7
Weekend	3.74 (.40) n = 34	5.40 (.35) n = 85	7.09 (.58) n = 23

NOTE: Numbers in parentheses represent standard errors.

statistics on the $BID amounts offered and the proportion of respondents accepting at each level.

A logit model is used to estimate the probability that the respondent is willing to pay the amount of the variable, BID, to retain his/her opportunity to visit the wilderness. As shown by Hanemann (1984), use of the logit model is consistent with utility theory. The theoretical logit model for CSMW users is

$$(1) \quad \log[p(\text{yes})/1 - p(\text{yes})] = f(\text{BID}, C),$$

where *BID* is the dollar amount presented to the respondent, and *C* is a congestion. Various congestion variables used in the empirical analysis are defined in table 4. The logit model is a cumulative distribution function for individual's compensating variation for recreation in the CSMW. Compensating variation is the increment in income needed to make an individual indifferent between two states of the world (i.e., visiting the CSMW or not visiting the CSMW) and is the traditional measure of consumer surplus (Mitchell and Carson 1989).

The results of three logit models estimated with the data are shown in table 5. The first objective, to examine the relative impacts of the actual experience versus pre-trip expectations of congestion on willingness to pay, is tested in models 1 and 2 by including variables for both actual and expected congestion in the logit estimations. As more encounters with other groups should decrease willingness to pay, the coefficients on ENC and MORENC are expected to have negative signs, while encountering fewer groups than expected, LESENC, should have a positive effect on willingness to pay.

Model 1 is estimated under the standard assumption of homogeneous preferences by time of visit, meaning the coefficients on the congestion variables are assumed to be the same for weekday and weekend users. The second hypothesis, that weekend and weekday wilderness visitors exhibit heterogeneous preferences for congestion, is tested by model 2. By multiplying the congestion variables (ENC, LESENC, and MORENC) by dummy variables indicating whether the visit occurred on a weekend or a weekday (see table 4) and reestimating the original logit model, the coefficients on the congestion variables for weekend and weekday users can be compared. Model 2 also includes a dummy variable (WKEND) that allows for a shift in the intercept in the willingness to pay curves for weekend and weekday users. If weekday users are more sensitive to congestion than are weekend users, as suggested by the attribute ratings discussed previously, the logit estimation should yield larger coefficients on the congestion variables for weekday users. Specifically, $\text{ENC}_{\text{WKDAY}}$ and $\text{MORENC}_{\text{WKDAY}}$ should have more negative impact on willingness to pay than $\text{ENC}_{\text{WKEND}}$ and $\text{MORENC}_{\text{WKEND}}$ respectively. Similarly, $\text{LESENC}_{\text{WKDAY}}$ is expected to have a more positive coefficient than $\text{LESENC}_{\text{WKEND}}$.

Table 3. Proportion of Respondents Answering Yes/No to Contingent Valuation Question at Various Bid Levels

Bid	% Yes	% No
$10	87.5 (42)	12.5 (6)
$20	75.0 (12)	25.0 (4)
$25	56.3 (18)	43.8 (14)
$40	50.0 (8)	50.0 (8)
$50	36.7 (11)	63.3 (19)
$70	41.2 (7)	58.8 (10)
$75	27.6 (8)	72.4 (21)
$85	14.3 (1)	85.7 (6)
$100	22.7 (10)	77.3 (34)
$150	0.0 (0)	100.0 (6)
Total	47.8 (117)	52.2 (128)

NOTE: Numbers in parentheses represent numbers of respondents.

Table 4. Congestion Variables Used in Willingness to Pay Models

Variable Name	Definition
ENC*	Actual number of encounters with other groups in the CSMW
LESENC*	= 1 if ENC was less than expected (0 otherwise)
MORENC*	= 1 if ENC was more than expected (0 otherwise)

*Subscript $_{\text{WKDAY}}$ or $_{\text{WKEND}}$ in table 4 indicates congestion variable has been multiplied by a dummy variable indicating time of visit (weekend or weekday).

Table 5. Parameter Estimates for Dichotomous Choice Willingness to Pay Models

Variable Name	Model 1	Model 2	Model 3
CONSTANT	1.520** (.393)	1.002* (.557)	1.303** (.386)
BID	−.0377** (.00550)	−.0391** (.00567)	−.0358** (.00529)
ENC	−.00578 (.0577)		
ENC_{WKEND}		−.0279 (.0749)	
ENC_{WKDAY}		.0821 (.1376)	
LESENC	1.154** (.380)		
$LESENC_{WKEND}$		.530 (.521)	.539 (.490)
$LESENC_{WKDAY}$		1.910** (.555)	1.553** (.515)
MORENC	−.339 (.480)		
$MORENC_{WKEND}$		−.787 (.577)	−.798 (.551)
$MORENC_{WKDAY}$		.753 (.922)	.609 (.899)
WEEKEND		.896 (.710)	.298 (.411)
McFadden R^2	.352	.373	.341
Sample size	236	236	239

*indicates significant at the 10% level; **indicates significant at the 5% level.
NOTE: Numbers in parentheses represent standard errors.

The results of the first model indicate that prior expectations of congestion play an important role in determining the effect of actual levels of encounters on willingness to pay. The coefficients on actual encounters are extremely close to zero and insignificant, while the coefficients on expected versus actual encounters (LESENC and MORENC) have the expected signs and are significantly different from zero for LESENC.

Model 2 is estimated under the assumption of heterogeneous preferences for congestion by time of visit. As with the first model, actual encounters ENC is insignificant for both weekend and weekday visitors. Encountering fewer groups than expected, LESENC, is positive and significant for both weekday and weekend users, although the coefficient on $LESENC_{WKDAY}$ visitors is more than three times the magnitude of $LESENC_{WKEND}$. The coefficients on $LESENC_{WKDAY}$ and $LESENC_{WKEND}$ are significantly different at a 90% confidence level, which supports the hypothesis that weekday users are more sensitive to increases in congestion.[2] As expected, $MORENC_{WKEND}$ has a negative impact on willingness to pay, but it is not significantly different from zero. $MORENC_{WKDAY}$ is insignificant and has the incorrect sign, but this result may be due to the small number of observations (7).

A problem with the second model is a high level of correlation (Pearson correlation coefficient = .446) between actual encounters, ENC, and whether a trip is taken during the week or a weekend, WKEND. F-tests of ENC, ENC_{WKEND}, ENC_{WKDAY}, and WKEND indicate that the variables representing actual encounters account for an insignificant amount of variation in the model, while WKEND is significant to the model, despite a t-value of only 1.35. As a result, a third model (table 4, model 3) was estimated without the variables for actual encounters but including the dummy variable, WKEND. As would be expected, the coefficient on the variable that was correlated with the actual encounters, WKEND, shows a large change, while the adjustments to the other parameters are relatively small. As in model 2, $LESENC_{WKDAY}$ is significantly larger than $LESENC_{WKEND}$, and $MORENC_{WKEND}$ has a negative sign.

The marginal impact of the congestion variables on willingness to pay for a wilderness visit can be derived from the results of a dichotomous choice contingent valuation model by dividing the coefficient of interest by the coefficient of BID. For the results in table 5 (column 3), the marginal value of seeing fewer groups than expected is $43.37 for weekday visitors, but only $15.06 for weekend visitors. Encountering more groups than expected reduces willingness to pay for weekend visitors by $22.29. Since the overall median willingness to pay for a trip to the Caribou–Speckled Mountain Wilderness is $68.14, the level of congestion has an important effect on the value of a wilderness visit.

Conclusions

The results of this study clearly support the need to account for expectations and heterogeneous preferences by time of visit. The modeling and interpretation of heterogeneous preferences are relatively straightforward, while properly accounting for expectations is considerably more difficult. The

effects of both expectations and heterogeneous preferences by time of visit have important policy implications for recreation management.

The most serious policy implication of heterogeneous preferences by time of visit has to do with benefit estimates of relieving peak-time congestion. One of the benefits of expanding recreation capacity is relieving congestion at substitute sites. If peak season visitors are less sensitive to congestion than nonpeak visitors, the benefits of relieving peak season congestion will be overestimated under the assumption of homogeneous preferences (Walsh and Gilliam 1982). In addition, a Cichetti and Smith (1973, 1976) type model of optimal use levels would underestimate the optimal level of use during peak periods and could lead to an inefficient rationing of peak season congestion. If some peak season use was shifted to nonpeak periods when visitors are more congestion-sensitive, a regulation resulting from the assumption of homogeneous preferences could result in a welfare loss.

In 1995, the 104th Congress passed legislation that for the first time permitted the U.S. Forest Service to charge user fees for recreation and for a portion of revenues from national park fees to remain in the budget of a specific park rather than to be allocated for general purposes in Washington. As the primary manager of most of the nation's wilderness and backcountry areas, the Forest Service now has the tool (higher prices) that economists have long advocated for reducing recreation congestion. When designing their new fee structures, it is logical that public recreation managers will look to the private sector for guidance. They will find that profit-maximizing recreation providers such as ski resorts, hotels, and amusement parks commonly have higher weekend prices, a practice that coincides with economists' recipe for maximizing benefits in the presence of a congestion externality. However, while peak-time pricing is a good strategy for many types of recreation, this study suggests that it may be inappropriate for wilderness and backcountry hiking.

Finally, the results of this study indicate that the effect of congestion on recreation benefits is best modeled by the difference between actual and expected congestion rather than by simple objective measures of actual congestion. This result is consistent with Shelby (1980), in that some visitors who encountered few other parties felt more crowded than did other visitors who encountered more parties. If, as this study demonstrates, actual congestion is not a good measure of the effect of crowding on recreation benefits, the optimal use model originally defined by Fisher and Krutilla (1972) and Cichetti and Smith (1973, 1976) can not be estimated. McConnell and Sutinen defined recreation equilibrium as "not equality of quantity supplied and demanded at the going price. Rather, it involves the equality of expected and realized (actual) congestion" (1984, p. 12). This definition may be a better model for recreation management. As long as expectations play an important role in an individual's recreation benefits, the problem of recreation congestion is more complex than the simple externality problem illustrated in much of the previous research.

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Appendix
Contingent Valuation Question from Survey Instrument

12. Visiting a wilderness area involves different types of expenses. These expenses may occur before the trip, during the trip, and on your return home. As best as you can estimate, how much are your total expenses for *this trip* to the CSMW for each of the following items? (*Only report expenses for that portion of your trip in which visiting the CSMW was your primary destination.*) If you did not purchase an item, please enter a zero in the appropriate blank.

PLEASE FILL IN ALL BLANKS.

TRANSPORTATION COSTS
(gas, oil, tolls, airfare, etc.) ..... $_____
FOOD AND BEVERAGES
(groceries, restaurants, etc.)..... $_____
LODGING (motel, camp rental) ..... $_____
MISCELLANEOUS
(camera film, bug spray, souvenirs).... $_____
EQUIPMENT PURCHASED
SPECIFICALLY FOR THIS TRIP
(tents, backpacks, etc.)..... $_____
OTHER EXPENSES (Please list)
_____ $_____

MY TOTAL EXPENSES FOR THIS
VISIT TO THE CSMW ..... $_____

13. Would you still have made this visit to the CSMW if your expenses had been $_____ *more* than the total you just calculated? (Check *one* box.)

Notes

1. The three sampled, access points account for about 90% of the areas use. For more details about the sampling techniques, survey results and the Caribou–Speckled Mountain Wilderness see Reiling, Michael, and McLean (1994).

2. Each observation in models 2 and 3 can be characterized by one of five dummy variables: $LESENC_{WKEND}$, $LESENC_{WKDAY}$, $MORENC_{WKEND}$, $MORENC_{WKDAY}$, and congestion as expected, which is the omitted case. The coefficients on the dummy variables are interpreted relative to the omitted case. To test for a significant difference between $LESENC_{WKEND}$ and $LESENC_{WKDAY}$, the logit model is reestimated with the dummy for congestion as expected replacing $LESENC_{WKEND}$. A t-test on the coefficient of $LESENC_{WKDAY}$ reveals that it is significantly different from $LESENC_{WKEND}$ at the 90% level. This procedure gives similar results for model 3.