

**FACTORS AFFECTING THE VALUE OF A
WILDERNESS VISIT: A CONTINGENT
VALUATION STUDY OF CARIBOU-
SPECKLED MOUNTAIN WILDERNESS USERS**

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A dichotomous choice contingent valuation model is estimated using an on-site survey of Caribou-Speckled Mountain Wilderness visitors. The results indicate that pre-trip expectations of various trip attributes such as congestion have a greater impact on a trip's value than the actual conditions of the visit. This research also shows that future economic studies of an area's non-market value can yield valuable information to managers about the characteristics and preferences of wilderness visitors.

Introduction

Land designated wilderness in the Eastern United States is very different than wilderness areas in the West. Unlike the West, Eastern wilderness has usually been logged in the past, and has historically been used for a variety of recreational purposes not generally associated with wilderness. Consequently, the challenge for the Eastern wilderness managers is not to preserve a wilderness, but to "grow" or "manufacture" wilderness where it has not existed in the past.

Designated in 1990, the Caribou-Speckled Mountain Wilderness (CSMW) is the White Mountain National Forest's latest contribution to the national wilderness system. A 12,000 acre tract located in Western Maine, the CSMW is best known for the open peaks of Caribou and Speckled Mountains and the waterfalls and slides along the brooks followed by the area's hiking trails. Typical of Eastern wilderness, the CSMW has been intensely logged three times in the past century, and one of its most popular recreation activities prior to wilderness designation was snowmobiling to the top of Speckled Mountain on a tote road leading to an abandoned fire tower. Its managers are now faced with creating a wilderness feeling in the area, and have developed a wilderness implementation schedule to accomplish this goal.

Managers often speak of the dual goals of abiding by the wilderness implementation schedule and maximizing visitor satisfaction or benefits. Maximizing the benefits or satisfaction of visitors requires managers to have a knowledge of what aspects of a CSMW visit contribute significantly to its value. The wilderness implementation schedule of the CSMW calls for the removal of all non-conforming (human-made) structures and reductions in the amount of directional signs and trail maintenance. Whether or not the goals of the wilderness implementation schedule are in harmony with the goal of maximizing visitor benefits depends on how human-made structures, directional signs and trail maintenance affect a trip's value.

Perhaps more important than the freedom from the physical signs of human influence as laid out by the wilderness implementation schedule, the benefits of wilderness recreation are affected by the level of solitude experienced by visitors. Most studies of wilderness benefits focus on the affects of crowding and congestion. The first visitor to a wilderness area experiences perfect solitude, but each additional user reduces the enjoyment of all users because solitude is reduced. Fisher and Krutilla (1972) have explained this relationship in terms more familiar to an economist. "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 total benefit is a maximum and the incremental or marginal benefit is zero." When studied by economists, the satisfaction or benefit derived from outdoor recreation is generally measured in terms of willingness-to-pay (WTP).

The effect of crowding on WTP was first studied by Charles Cichetti and Kerry Smith in the mid '70's. Cichetti and Smith (1974) mailed surveys to 600 Spanish Peaks (MT) users and had them respond their WTP to a variety of hypothetical recreational experiences which varied by the number of trail encounters, camp encounters and length of stay. They found both camp and trail encounters to have significant, negative impacts on willingness-to-pay. Subsequent studies (McConnell and Sutinen 1984, Shelby 1980) have further demonstrated this negative relationship between encounters and WTP. Congestion is usually defined as the total number of encounters, but may be better represented by the rate of encounters. People on a short hike probably have a lower tolerance for the total number of encounters than those on a longer trek. Thus, the WTP model in this paper uses both total encounters and encounters per hour of hiking as measures of congestion.

In addition to the affect of actual congestion, the role of prior expectations of crowding on WTP have been investigated (Prince and Ahmed 1988, Menz and Mullen 1980). It is believed that the failure of models such as Cichetti and Smith to account for unrealized expectations of crowding has a downward bias on WTP. Collecting information on prior expectations in a post-visit interview poses some data collection problems. The response to the expectations question immediately following the visit, as done by Prince and Ahmed, is likely to be affected by the actual conditions. The response to an expectations question immediately preceding a hike may be affected by the number of cars or the perceived level of crowding at the trailhead. Despite data collection difficulties, expected crowding has been shown to have some impact on WTP.

Table 1. Independent variables in the WTP logit model.

Variable Name	Expected Sign	Variable Definition
BID	-	\$ amount presented to respondent
<u>Trip characteristics</u>		
SPENT	+	total trip-related expenditures
LENVIS	+	time spent in CSMW in hours
ENC	-	# encounters with other groups
ENC PER HOUR	-	# encounters per hour spent in the CSMW
EXENC	-	# encounters Dummy variable (1=more than expected, 0=about as ex, -1 = less than ex)
EXWILD	+	amount of wildlife seen Dummy variable (1=more than expected, 0=about as ex, -1 = less than ex)
<u>Site characteristics</u>		
EXMM	-	# of man-made structures Dummy variable (1=more than expected, 0=about as ex, -1 = less than ex)
EXTRMT	-	level of trail maintenance Dummy variable (1=more than expected, 0=about as ex, -1 = less than ex)
EXSIGN	-	# of directional signs Dummy variable (1=more than expected, 0=about as ex, -1=less than ex)
<u>Visitor preferences</u>		
MORWILD	-	seeing wildlife or signs of wildlife (3=very imp., 2= somewhat imp., 1= not important)
FEWENC	-	seeing few other groups (3=very imp., 2= somewhat imp., 1= not important)
NOMM	-	no man-made structures in CSMW (3=very imp., 2= somewhat imp., 1= not important)
GOODTR	+	condition of trail system in CSMW (3=very imp., 2= somewhat imp., 1= not important)
FEWSIN	-	fewer directional signs in CSMW (3=very imp., 2= somewhat imp., 1= not important)
<u>User characteristics/ Demographics</u>		
HIKTR	-	#of hiking trips in past 12 months
CSMVIS	-	# of visits to CSMW in past 2 years
INC	+	total household income in 1992
EDUC	+	# of years of school completed
MEM	+	member of environmental group (1=yes, 0=no)
AGE	?	age of respondent in years
FEM	?	sex (1=female, 0=male)

Similar data collection problems confound efforts to include physical site condition variables mentioned earlier such as trail maintenance, man-made structures and the amount of directional signs. While the condition of a given trail may be the same for all visitors, its performance or effect on WTP is different. Asking people to make a subjective evaluation of quality has the problem of keeping people on the same scale (one person's good may be another's poor). Evaluating the effect of unrealized expectations of physical characteristics on WTP in a way similar to that done with congestion may be a good way to evaluate the importance of these various characteristics.

Most of these previous studies have used open-ended or iterative bidding games to elicit WTP. Recently, dichotomous choice contingent valuation in which an individual responds yes or no to whether they would be willing to pay. In this study, for example, respondents were asked if they would still have visited if their expenses had been \$X more? The advantages of dichotomous choice questions is their similarity to more familiar "take it or leave it" style transactions, and that it avoids the starting point bias of iterative bidding games.

In this study, dichotomous choice contingent valuation is used to measure the value of a visit to the Caribou-Speckled Mountain Wilderness. The dichotomous choice contingent valuation model used for this study estimates the probability an individual would pay a given amount to retain their opportunity to visit the wilderness. It is estimated with a logit model as this is consistent with utility theory (Hanemann 1984; Loomis 1988). The theoretical logit model for CSMW users is

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

where BID is the dollar amount presented to the respondent, TC is a set of visit characteristics, SC is a set of site characteristics, PR are the respondents preferences for various wilderness conditions, and DEM is a vector of user characteristics and demographic data. All the variables are defined together in Table 1.

Data Collection

Between June 15, 1993 and September 15, 1993, CSMW visitors were surveyed at trailheads as they left the wilderness area. Three sites (Caribou parking area, Brickett Place, and Stone House parking area) were each sampled for eighteen days, twelve weekdays and six weekend days at each site. The interviewer approached every recreational (non-commercial) group leaving the wilderness. Of the 259 groups encountered, only one group refused to complete the survey. A summary of the descriptive results of the survey is shown in Table 2. After removing unusable surveys due to missing data, a total of 171 observations were included in the Logit analysis.

Table 2. Selected summary statistics of survey respondents.

Average time in wilderness area	4.97 hours
Average number of encounters	4.27
Average encounters per hour	.88
Average expenditures for visit	\$42.15
Previously visited CSMW	63.2%
Average Age	39.8 years
% Female	37.4%
Member environmental organization	52.6%
Average annual household income	\$58,406
N=171	

Logit Results

The results of the logit models are shown in Table 3. Column one shows the results when congestion is defined as total encounters, and column two uses encounters per hour as a measure of congestion.

None of the visitor preference or demographic characteristics are statistically significant. The inverse relationship between the bid amount and WTP is significant and expected. The significance of three of the five expectations variables is the most striking result. The difference between actual encounters and expected encounters is significant and signed as expected as is the difference between actual and expected number of human-made structures. While neither encounters or encounters per hour are statistically significant, it is noteworthy that encounters per hour performed better than total encounters.

Total expenditures is positively signed and significant, indicating that respondents were more willing-to-pay the additional amount if it was a smaller portion of their total expenditures. The significance of the expected encounters and insignificance of the two actual encounters variables, indicate that the expected level of congestion is more strongly related to WTP than the actual level of congestion itself. The difference between expected and actual levels of trail maintenance and directional signing do not have as significant effect as wildlife and man-made structures.

Table 3. Results of logit model. (t- ratios in parenthesis)

Variable Name	(1)	(2)
CONSTANT	-1.220 (-.56)	-.761 (-.34)
BID*	-.0492 (-5.33)	-.0493 (-5.32)
<u>Trip characteristics</u>		
SSPENT*	.0119 (2.21)	.0118 (2.18)
LENVIS	.194 (1.37)	.155 (1.15)
ENC	-.0478 (-.525)	(-.48) (-1.03)
ENC PER HOUR	-.950 (-2.38)	-.882 (-2.19)
EXENC*	-.841 (-2.28)	-.872 (-2.36)
<u>Site characteristics</u>		
EXMM*	-1.041 (-1.99)	-1.084 (-1.91)
EXTRMT	.300 (.78)	.347 (.39)
EXSIGN	.272 (.69)	.248 (.63)
<u>Visitor preferences</u>		
MORWILD	.201 (.49)	.232 (.57)
FEWENC	.159 (.442)	.138 (.384)
NOMM	.117 (.36)	.082 (.25)
GOODTR	-.171 (-.45)	-.157 (-.42)
FEWSIN	.215 (.58)	.268 (.72)
<u>User characteristics/ Demographics</u>		
HIKTR	-.0625 (-1.02)	-.0581 (-.95)
CSMVIS	-.372 (-.72)	-.330 (-.63)
INC	.00000473 (.66)	.00000480 (.67)
EDUC	.0612 (.27)	.0525 (.23)
MEM	.307 (.62)	.277 (.56)
AGE	.00642 (.29)	.00388 (.18)
FEM	.234 (.51)	.275 (.59)
McFadden R ²	.387	.391
N	171	171

* indicates significant at the 95% level

Discussion and Implications

This study shows that a wilderness visitors pre-trip expectations may be more important to a visit's value than the actual visit characteristics. If this is the case, it indicates that wilderness managers can enhance backcountry experiences by making more and better planning information available, so that potential visitors are able to have more accurate expectations of an area. Very little study has been done on the how backcountry visitors develop their expectations about the experience. Further study on the formation of pre-trip expectations is necessary before good suggestions can be made as to how wilderness managers can help visitors form more accurate expectations before their visit.

As debate over the use of public lands intensify, there will likely be more studies of the non-market and recreational value of wilderness areas. This study shows that studies of economic value for wilderness areas can yield valuable information about visitor preferences for area managers if properly designed before hand. These results can even be extended to determine the use level which maximizes the area's total use value (see Cichetti and Smith 1973; Michael 1994). By getting involved in these economic studies, wilderness managers can utilize a valuable source of information on user characteristics, preferences and attitudes.

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