The Review of Regional Studies, Vol. 36, No. 3, 2006, pp. 362 – 380 *ISSN 1553-0892*

The Review of Regional Studies

Oklahoma State University

Recreation as a Spatial Good: Distance Effects on Changes in Recreation Visitation and Benefits

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Abstract

The effects of travel distance on visitation and associated recreation benefits are tested for a large national park. Visitor responses to a survey depicting various natural resource scenarios at Rocky Mountain National Park were used to estimate the effects of distance traveled on nature-based tourism behavior and benefits. Distance was a significant determinant in both the visitation and contingent valuation models. Long-distance visitors were more stable in their visitation patterns in the face of natural resource changes. Marginal recreational benefits per trip increased with distance but at a decreasing rate. However, in-state visitors accrued higher annual benefits because of greater trip frequency. The relative importance of visitor types can help private and public decision-makers better respond to different visitor needs. The findings also provide a unique perspective on consumer spatial tradeoffs and the national value of recreational resources.

Keywords: National parks; Recreation benefits; Contingent valuation; Distance

JEL classification: Q26; Q51; R12

Tom Hobbs, Dennis Ojima, Jill Baron, and other scientists at the Natural Resource Ecology Laboratory, Colorado State University, provided data and information to support the design and implementation of this study. Funding was provided by the Colorado Agricultural Experiment Station, Regional Research Project W1133, and the U.S. Environmental Protection Agency STAR (Science to Achieve Results: R 827-449-01-0) program. The suggestions of two reviewers improved the paper. Any errors or omissions are those of the authors.

1. INTRODUCTION

The impacts of natural resource changes on a visitor's recreation experience may affect decisions about the frequency and duration of future visits to a national park as well as the economic benefits (willingness to pay) of the recreation experience. Changes in visitor behavior will affect park management parameters as well as local economic activity in the park's gateway community. For park managers and these intertwined communities, variations in visitor use and spending can significantly influence resource impacts, facilities construction, labor needs, and planning decisions. A better understanding of such visitor flows can help clarify both private and public sector decision making. Furthermore, the behavior and benefits underlying such varying flows also provide an insightful perspective on consumer spatial tradeoffs and resource valuation.

In this paper, a contingent visitation analysis, an application of contingent behavior analysis, is used to estimate the effects of distance traveled on national park *visitation* (number of annual trips). In addition, the contingent valuation method is used to assess the effect of distance-related variables on recreation *benefits* (measured as willingness to pay). For both analyses, a visitor survey at Rocky Mountain National Park (RMNP) in Colorado was used to elicit visitor attitudes about changes in resources and conditions as presented in hypothetical climate and resource scenarios. From this basis, we then consider (1) the effect of distance traveled on contingent visitation behavior (CVB) and willingness to pay (WTP) responses, and (2) whether long-distance visitors are more or less likely to change their visitation behavior with changes in natural resource conditions than nearby visitors. Distinctions in recreational behavior based on distance traveled highlight likely trends in ensuing visitation, benefits, and spending. The results permit the comparison of the per-trip and annual benefits of nearby (in-state) and long-distance (out-of-state) visitors to a large national park in the western U.S.

More generally, the results can shed light on spatial effects in consumer valuation and decision making (e.g., Mushinski and Weiler 2002). RMNP is not only a destination in itself, but is also a geographic center point for the diverse recreational amenities of the Front Range of the Rocky Mountains. In the present case, it could be argued that those with the greatest economic benefits for such recreation will disproportionately locate near the focal amenity, leading to monotonically decreasing benefits for longer-distance visitors. This hypothesized spatial structure is akin to Tiebout (1956) sorting for public goods, setting a benchmark for valuation based on those who reveal a preference for a residential location near the recreational amenity. Yet those who do not have such amenities nearby might ostensibly value the recreation site even more than this high local benchmark, suggesting a significant national recreation value to a regional resource. The present analysis can test consumer WTP per trip over distance to assess the relative validity of these spatial sorting perspectives while indirectly indicating the broader public value of the recreational resources embedded in public lands.

The theoretical foundation for this analysis is the travel cost recreational demand model, which posits that the demand function for a particular recreation site is derived from the travel cost demand function (Bockstael and McConnell 1981; Smith and Kopp 1980; Deyak and Smith 1978). This model assumes that distance traveled contributes to the implicit price of recreation, which is the basis for the demand function. Parsons and Hauber (1998) investigated the role of distance in the spatial extent of recreation markets by analyzing how far from home particular recreation sites must be before they are no longer considered part of the visitor's choice set, effectively sketching the market area of specific sites. Specifically, they considered the spatial boundaries used to define choice sets in day-trip fishing in Maine and found that beyond some threshold distance, adding sites to the choice set has negligible effects on either the probability of visitation or utility. An earlier analysis of the spatial limits of the travel cost model was performed by Smith and Kopp (1980), who evaluated the role of distance in determining whether visitors were on single destination trips or multiple destination trips.

The primary purpose of this analysis is to consider the question of whether more distant visitors are more or less likely to change visitation behavior and/or respond differently to WTP questions with changes in natural resource conditions. This analysis extends the travel cost recreation literature in the analysis of the effects of distance traveled on responses to CVB and WTP questions in the context of hypothetical climate and resource scenarios. This is the first analysis of the effect of distance traveled on visitation–behavior or recreation benefits associated with changes in climate and resources at the destination.

A secondary purpose of this paper is to add to the limited literature on the effects of climate on recreational use. A few studies have recorded the effects of climate on recreation visitor demand. Cato and Gibbs (1973) used a survey of recreational boaters in Florida to find that temperature and expected rainfall had a significant effect on the likelihood of taking a boating trip. Loomis and Crespi (1999) estimated that a 2.5°C increase in temperature and a 7 percent increase in precipitation were associated with a 3.1 percent increase in visitor days for eight groups of outdoor recreation activities. Significant decreases in downhill and cross-country skiing days (52 percent) were offset by increases in reservoir (9 percent), beach (14 percent), golf (14 percent), and stream recreation (3.5 percent). Scott, McBoyle, and Mills (2003) found negative effects of climate change to demand for winter recreation activities such as snow skiing due to warmer temperatures and reduced snowfall.

Only a few studies have considered the effects of climate on recreation benefits. In quantifying the WTP for beach use, McConnell (1977) and Silberman and Klock (1988) found temperature to have a positive and statistically significant effect on net benefits. Loomis and Crespi (1999) estimated a welfare gain of over 3 percent from the impact of climate change on eight groups of recreation activities based on 1990 use levels. Mendelsohn and Markowski (1999) estimated that a 2.5°C increase in temperature and a 7 percent increase in precipitation would generate a 7-9 percent increase in recreation benefits. Richardson and Loomis (2005) found temperature and precipitation to be significant determinants of stated WTP for recreation visits and predicted slight increases in overall recreation benefits due to climate change.

The analysis has two main parts. First, a model of visitor behavior is constructed to measure the effect of distance traveled on contingent visitation behavior. Second, a visitor valuation model is used to measure the effect of travel distance on willingness-to-pay. Responses to climate and resource changes can thus be analyzed to determine the effects of distance on contingent visitation variability as well as visitor valuation for a prime recreational resource. The paper's two principal findings are that (1) long-distance visitors' behavior is more resistant to changes in park natural resources and climate, and (2) the benefits of a marginal trip for long-distance visitors are greater than those of nearby or in-state resident visitors, despite the latter group's revealed preference for the recreational amenity by their residential decision (which implies greater annual benefits to local residents because of more annual trips). This high benchmark strongly suggests that recreational resources in public lands indeed represent a broader national good, substantially valued even by those furthest away from the resource as well as by Colorado residents.

2. THEORETICAL MODELS

2.1 Contingent Visitation Behavior

Consider an individual's utility function, represented by $u(x_j, q_j, Z)$, where $u(\cdot)$ is utility, x_j is the annual number of trips to recreation site j, q_j represents the quality of site j, and Z represents a vector of all other goods with price normalized to one. The individual will maximize his/her utility subject to his/her budget constraint, represented by $I = p_j x_j + Z$, where p_j represents the travel cost or implicit price of access to site j (which presumably increases with distance traveled). A system of Marshallian demand functions $[x(p_j, q_j, I)]$ emerges with the quantity of trips (x_j) decreasing in price (and distance traveled), increasing in quality, and increasing in income (Whitehead, Haab, and Huang 2000).

An individual's recreation visits to a national park may be influenced by expected climate conditions in the area, particular park resources, and other variables, including but not limited to recreation activities, travel cost (represented by distance traveled), and demographic characteristics. The probability of a contingent change in visitation behavior is modeled as a function of these explanatory variables; the theoretical model for the contingent visitation analysis is represented as follows:

$$(1) \qquad \Delta V_i = f\left(S_{1i}, S_{2i}, \ldots S_{mi}, A_{1i}, A_{2i}, \ldots A_{ni}, DIST_i, D_{2i}, \ldots D_{oi}\right),$$

where

ΔV_i = whether there is a contingent change in respondent i's number of visits to the recreation site (binary variable – yes/no) given the climate induced change in natural resources;

$S_{1i}, S_{2i}, \ldots, S_{mi}$ = climate and resource variables, including temperature, precipitation, number of days with snow-free hiking trails, elk population, ptarmigan population, and the vegetation composition of the Park;

$A_{1i}, A_{2i}, \ldots, A_{ni}$ = activities in which the visitor participated during the visit;

$DIST_i$ = distance traveled per visit;

$D_{1i}, D_{2i}, \ldots, D_{oi}$ = demographic characteristics of the visitor, including gender, age, level of education, annual income, employment status, and membership in an environmental organization; and

i = individual respondent to survey.

From Equation (1), the null hypothesis states that the distance variable ($DIST_i$) has no effect on the respondent's decision to change their stated number of visits per year ($\beta_{DIST} = 0$). Rejection of this hypothesis would suggest that the change in visitation behavior is influenced by distance traveled; short-distance travelers may be largely day visitors, and their behavior may be more affected by climate and park resource variables than that of long-distance travelers who may plan national park trips well in advance and whose visits are more likely associated with summer vacations.

Contingent visitation behavior (CVB) analysis has been applied in several previous recreation studies, but most combined stated-preference visitation data with revealed-preference travel cost data to measure contingent effects on consumer surplus (Whitehead, Haab, and Huang 2000; Loomis, Gonzáles-Cabán, and Englin 2001; Grijalva et al. 2002). Loomis (1993) found that the CVB method demonstrates external validity in his study of hypothetical recreational visits under varying lake quality levels. Chase et al. (1998) used CVB analysis to measure the hypothetical impact to visitation demand of alternative entrance fee levels at three national parks in Costa Rica.

2.2 Contingent Valuation of Recreation Benefits

The recreation benefits to a consumer are a measure of the utility the consumer obtains from the recreation experience (Loomis and Walsh 1997). The level of particular weather variables may influence the benefit or utility derived from the recreation experience. The contingent valuation method (CVM) has been used extensively to measure changes in recreation benefits under varying levels of particular amenities. CVM is an accepted method of valuing recreation benefits as well as other benefits for which no market exists (Cummings, Brookshire, and Schulze 1986; Loomis 1987). The U.S. Department of Interior (1986), which oversees the National Park Service, has approved CVM for valuing natural resource damages. CVM is one of two preferred approaches for valuing outdoor recreation in federal benefit-cost analyses (U.S. Water Resources Council 1983). Some critics of the method have raised concerns over possible overvaluation due to hypothetical bias (Diamond and Hausman, 1994). However, for purposes of this analysis, if hypothetical bias is similar at all distance levels, estimates of the marginal impact of distance would be unaffected.

The theoretical representation of the analysis of the effects to recreation benefits follows Hanemann (1984). It is assumed that an individual's indirect utility is a function of his/her recreation experience at RMNP (represented by *R*) and the consumption of all other goods (represented by income *I*). Since consumption of the recreation good may depend on an individual's income as well as personal preferences (known only to the individual), not all arguments in the utility function are observable. Therefore, some components of each individual's utility function are treated as stochastic, resulting in an indirect utility function and a stochastic element as follows:

(2) $$U = f(R, I) = v(R, I) + e,$$

where *e* represents an independent, identically-distributed error term with a zero mean.

Under the dichotomous-choice approach, survey respondents are asked whether they would still take their most recent trip to RMNP if travel costs (as a proxy for distance traveled) were $\$X$ higher. The respondent will answer yes if his/her utility from the recreation experience (with the associated loss of $\$X$ in income) is greater than or equal to his/her original utility level without having taken the trip. The "YES" respondent would hypothetically take the trip ($R = 1$) at the higher travel cost, and the "NO" respondent would choose not to take the trip ($R = 0$). Therefore, the probability of a YES response is represented as follows:

(3) $$P(YES \mid \$X) = P[f(R = 1, I - \$X) \geq f(R = 0, I)].$$

Since the individual's utility function is not observable to the researcher, it is common to assume that the utility function in Equation (3) has a stochastic element, which results in the following transformation of the probability function:

(4) $$P(YES \mid \$X) = P[v(R = 1, I - \$X) + e_1 \geq v(R = 0, I) + e_2],$$

where e_1 and e_2 are error terms with means of zero (Loomis 1987). The distribution of the difference in the error terms in Equation (4) is assumed to be a standard logistic function (Hanemann 1984; Loomis 1987). The responses to the dichotomous-choice question are analyzed using a binary logit model in order to estimate WTP. The theoretical model for the contingent behavior analysis can therefore be represented as follows:

(5) $$WTP_{it} = f(W_{1it}, W_{2it}, \ldots W_{mit}, A_{1i}, A_{2i}, \ldots A_{ni}, DIST_i, D_{1i}, D_{2i}, \ldots D_{oi}),$$

where

WTP_{it}	=	net benefits (willingness to pay) from recreation experience;
$W_{1it}, W_{2it}, \ldots, W_{mit}$	=	daily weather variables, including temperature, precipitation, wind-speed, and cloud-cover;

$A_{1i}, A_{2i}, \ldots, A_{ni}$ = activities in which the visitor participated during the visit;

$DIST_i$ = distance traveled per visit;

$D_{1i}, D_{2i}, \ldots, D_{oi}$ = demographic characteristics of the visitor, including gender, age, level of education, annual income, employment status, and membership in an environmental organization;

i = individual respondent to survey; and

t = date of recreation visit.

From Equation (5), the null hypothesis states that the distance variable ($DIST_i$) has no effect on the respondent's stated willingness to pay. Rejection of this hypothesis would imply that willingness to pay is affected by travel distance; long-distance travelers may place a greater value on their visit to the park than short-distance or day visitors for several reasons, including that: (a) long-distance visitors plan their summer vacations well in advance of the trip, increasing the anticipation part of the recreation experience (Clawson and Knetsch 1971, p. 33); (b) long-distance travelers may take only one annual trip to RMNP, so the trip has high marginal utility as compared to nearby or day visitors, who may make numerous visits to the park during the year.

3. EMPIRICAL EXAMPLE AND SURVEY DESIGN

The recreation site for the empirical analysis is Rocky Mountain National Park, a 266,000-acre alpine preserve in north-central Colorado in the Front Range of the Rocky Mountains. The Park protects a large wildlife population, alpine meadows, conifer forests, aspen groves, and several high mountain peaks (including Long's Peak, the Park's tallest). RMNP receives over three million visitors annually, with significant seasonal variation. (Eighty-seven percent of annual visitation occurs between May and October, suggesting an influence of seasonal climate.)

A visitor survey was conducted in the summer of 2001 at RMNP. Scientists at the Natural Resource Ecology Laboratory at Colorado State University provided data for a baseline climate and resource scenario and hypothetical scenarios as depicted by two global circulation models, which specified expected temperature levels, precipitation, and snow depth. Both of the scenarios developed by the two models used a baseline time period of 1961 to 1990 for the assessment. The CCC (Canadian Climate Center) scenario tended to be more than 4° F warmer than the historical baseline period and predicted a drier overall climate. The Hadley scenario predicted 2° F warmer than the baseline, greater precipitation in the winter season, and a drier summer season. Population dynamics models were used to estimate the impact of climate on park resources, including wildlife and vegetation composition; these models predicted an increase in the population of elk, a nearly complete loss of alpine tundra, and an associated loss of bird species that nest in the tundra (e.g., ptarmigan).

Data from the two climate forecasts and the resource impacts were configured as scenarios for the survey; four other hypothetical scenarios were created in order to incorporate a wider range of hypothetical natural resource and climate variation. In total, four survey versions were developed, each with a "typical day" (baseline) scenario and two hypothetical scenarios. An excerpt from one version of the visitor survey containing the depiction of the climate scenarios is presented in Figure 1.

	Typical Day	**Scenario 1**	**Scenario 2**
Temperature # days with summer high temperature greater than 80°F	3 days	15 days	20 days
Precipitation Number of summer days with precipitation above 0.25 inches	18 days	15 days	28 days
Elk Each elk symbol represents about 200 elk	1,040 elk	1,500 elk	600 elk
Vegetation Composition	(% acres)	(% acres)	(% acres)
Alpine tundra	15%	0%	25%
Open woodland	2%	20%	5%
Evergreen	77%	72%	70%

FIGURE 1. Excerpt from the Visitor Survey: Climate Scenarios

The contingent visitation behavior questions asked the respondent whether they would change the frequency of their visits with the hypothetical climate and resource scenarios. (See Figure 2 for an excerpt from the visitor survey containing the CVB questions.) Information about distance traveled was elicited along with demographic characteristics in order to test for potential effects.

For the contingent valuation analysis, the visitor survey also asked respondents whether they would have made their trip if travel costs had been higher. (See Figure 3 for an excerpt from the visitor survey containing the contingent valuation question.) Bid amounts in the survey ranged from $1 to $495, and this range was chosen based on other recent surveys of willingness to pay for recreation.

Question:	**Scenario 1**	**Scenario 2**
If at the beginning of the year, you knew Rocky Mountain National Park weather and conditions would be as described in Scenarios 1 and 2 rather than the current scenario, would you:	__Visit ***more*** often? # additional yearly trips ____ __Visit ***less*** often? # fewer yearly trips ____ __ *No change* in # trips	__Visit ***more*** often? # additional yearly trips ____ __Visit ***less*** often? # fewer yearly trips ____ __ *No change* in # trips
Would the changes in weather and resources described in Scenarios 1 and 2 affect your *length of stay* in Rocky Mountain National Park on a typical trip?	Would you stay ___ **Longer**? ____ days longer ___ **Shorter**?____ days fewer ___ **No change**?	Would you stay ___ **Longer**? ____ days longer ___ **Shorter**? ____ days fewer ___ **No change**?

FIGURE 2. Excerpt from Visitor Survey: Contingent Visitation Behavior Questions

As you know, some of the costs of travel such as gasoline have been increasing. If the travel cost of this most recent visit to Rocky Mountain National Park had been $___ higher, would you have made this visit? *Circle one:* *YES* *NO*

FIGURE 3. Excerpt from Visitor Survey: Contingent Valuation Question

Surveys were tested with focus groups for content, clarity, and length; and the design was modified according to the focus group comments. The final survey version was pre-tested with visitors before distribution during the sampling period. During the survey period (June 21 – September 12, 2001), visitors were selected randomly in heavily-visited areas of RMNP at various locations in order to survey visitors who had been participating in a variety of recreation activities. Survey dates were selected in order to obtain samples from weekdays, weekends, and holidays. On selected sampling dates, visitors were approached randomly at the chosen sites and surveys were distributed to willing respondents, who took the surveys with them to be completed and mailed in at a later date. Mail-returned surveys were chosen because of the complexity of the climate and resource scenarios and the time required to complete the questionnaire. There were 1,378 survey attempts during the sampling period, and 112 were refused. Thus, a total of 1,266 surveys were distributed. Following Dillman's Total Design Method (Bailey 1994), reminder postcards were mailed to survey recipients one week after the day of distribution and supplementary copies of the survey with a cover letter were mailed three weeks later to non-respondents. At the end of the survey collection period, 967 surveys were returned, which amounts to a 70 percent response rate (or a 76 percent response rate net of refusals).

4. DATA ANALYSIS

For the contingent behavior analysis, a trip response model is specified in order to estimate coefficients for the independent variables. Since each survey included contingent behavior questions for two climate and resource scenarios, responses were restructured in such a way that each survey response represents two scenario responses, thereby doubling the number of observations in the sample. Therefore, although 967 surveys were returned, the number of contingent behavior observations in the sample is 1,934.[1]

Two statistical analysis techniques are used to test the hypotheses. First, binary probit regression is used to analyze the CVB responses (would a visitor change the frequency of trips as a binary variable) as a function of scenario variables, distance traveled, and demographic variables. Second, responses to the willingness-to-pay question are analyzed with a commonly-used binary logit model to estimate the effects of ***distance*** on recreation benefits. While these two models are related, the CVB analysis is driven by the climate and resource scenarios, and the WTP model is based on weather conditions on the day of the survey.

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[1] Since each respondent answers two questions, we do not have complete independence of each observation. That is, we have a small panel effect. Our use of a probit model without a "random effects" panel specification may violate the assumption of independence of observations. However, this is minor since it merely involves the pooling of two observations per person. Furthermore, correcting for it using random effects would improve our statistical efficiency and reduce our variances, thereby increasing the statistical significance of our coefficients. Thus we have a lower level of statistical significance in our paper than if we did not violate this assumption.

5. RESULTS

5.1 Visitation Effects

Over 66 percent of respondents indicated that their most recent trip to RMNP was either the "sole destination" or "primary purpose" of the trip. More than 70 percent of respondents indicated that the activities of viewing conifer forests, viewing wildflowers, and driving over Trail Ridge Road were either "important" or "very important" to their decisions to visit RMNP. Of respondents to the scenarios that were based on the two global circulation models, 8.6 percent and 11.1 percent indicated that they would change their annual number of trips based on the CCC and Hadley scenarios, respectively; 11.5 percent and 13.5 percent would change their length of stay. A summary of survey responses is presented in Table 1.

A multivariate analysis involving a qualitative response model distinguishes visitors who would change their behavior (contingent upon the climate and resource scenarios) and those who would not. A binary probit regression analysis on whether survey respondents would change their visitation behavior under the hypothetical scenarios revealed the following results, presented in Table 2. The dependent variable in the probit regression is the binary response to the CVB question and is equal to 1 if the respondent indicated that he/she would change the frequency of visitation with the hypothetical climate and resource scenarios and equal to 0 if the respondent indicated "no change" in frequency of trips.

The probit results indicate that each of the climate and resource variables (including changes in temperature, precipitation, elk population, and the composition of vegetation) are significant determinants at 95 percent or greater. The coefficient estimate on the distance traveled variable is negative and significant at 99 percent, which implies that visitors traveling longer distances are less likely to change their visitation behavior based on climate and resource impacts. The coefficient on the variable interacting distance traveled and distance to alternative recreation destination is also negative and significant at 99

TABLE 1
Survey Results: Summary Statistics for Two Climate Scenarios

Survey Results	CCC (n = 442)	Hadley (n = 252)
Number of respondents who would change their number of trips	38	28
Number of respondents who would change their length of stay	51	34
% of respondents who would change their number of trips	8.6	11.1
% of respondents who would change their length of stay	11.5	13.5
Average stated change in visitation (#)	432,533	316,103
Average stated change in visitation (%)	13.6	9.9
Mean change in annual visitor days	1,357,588	1,002,080

TABLE 2

Binary Probit Regression Results for CVB Analysis

Variable		Coefficient	z-Statistic
Intercept		-1.060400	-3.514488
Change – number of days with high temperature > 80ºF	*	0.015112	4.393530
Change – number of days with precipitation > 0.25 inches	*	-0.014092	-1.681321
Change – number of elk	*	0.000147	1.697279
Change – percentage of RMNP acres of alpine tundra	*	0.017206	2.085792
Hiking (1 = participated, 0 = no)	*	0.333249	1.873263
Picnic (1 = participated, 0 = no)	*	-0.182338	-1.886640
Distance traveled (in miles)	*	-0.000390	-2.926925
Distance traveled, squared (in miles)	*	7.12E-08	2.706222
Distance to alternative recreation destination (in miles)		-0.000296	-1.620993
Distance traveled · distance to alternative destination	*	-3.73E-07	-2.003862
Gender (1 if male, 0 if female)	*	0.235331	2.452442
Age (in years)	*	-0.007778	-1.684417
Retired (1 = yes, 0 = no)		0.066409	0.394262
Income ($)		1.20E-06	1.276408

Log likelihood = -446.8007
McFadden R^2 = 0.091, *significant at or above 90%

percent, which implies that visitors who live further away from both RMNP and their alternative destination are less likely to change their visitation behavior because of climate and resource impacts. The quadratic term is used to test for the linearity of the distance effects, and the results suggest that the relationship between distance and trips is not linear.

In order to examine the effect of distance traveled on visitation behavior, probabilities of contingent changes in visitation for varying travel distances were estimated. Coefficient estimates from the probit equation were applied to mean values of explanatory variables (including distance-related variables at 100-mile increments). Figure 4 illustrates that the probability of a contingent change in visitation behavior declines with increasing travel distance, implying that visitors traveling longer distances are less likely to change their recreation behavior based on changes in climate or park resources. Long-distance travelers appear to be more stable in their visitation behavior, even in the face of changes in climate or park resources.[2] Probability of changing visitation behavior declines sharply for shorter-distance travelers, demonstrating a heightened sensitivity to climate or resource changes for in-state visitors. This may be

[2] We tested for a possible intercept shift for in- and out-of-state respondents, using a test of coefficient equality (Chow 1960). The F-statistic (3.866) exceeded the critical value (1.94), so we reject the hypothesis that coefficients are equal between subsets, which is consistent with the argument that trip behavior and recreation benefits differ for nearby and long-distance visitors.

associated with differences in trip planning across the sample—survey data revealed that visitors who traveled more than 200 miles one-way planned their trips an average of 96 days in advance, as compared to an average of 27 days in advance for those who traveled 200 miles or less. Long-distance travelers (who planned their trips well in advance) may be less likely to indicate a change in visitation in their responses.

5.2 Recreation Benefits

Results of a binary logit analysis of the dichotomous choice responses to the CVM question of willingness to pay are provided in Table 3. The dependent variable in this case is the binary response to the willingness to pay question; the variable is equal to 1 if for respondents who indicated that they would pay the bid amount (YES) and 0 for those who indicated they would not pay (NO). Insignificant variables were eliminated from the hypothesized model in order to estimate at a logit equation that could be meaningfully reparameterized into a WTP function. Based on these results, the hypothesis that the coefficients on distance traveled and distance squared are equal to zero is rejected. The coefficient estimates on these two variables are significant at the 99 percent level. These results suggest that longer travel distance is associated with a greater likelihood of responding "yes" to the WTP question (at a decreasing rate overall). The quadratic term is used to test for the linearity of the distance effects, and the results suggest that the relationship between distance and WTP is not linear.

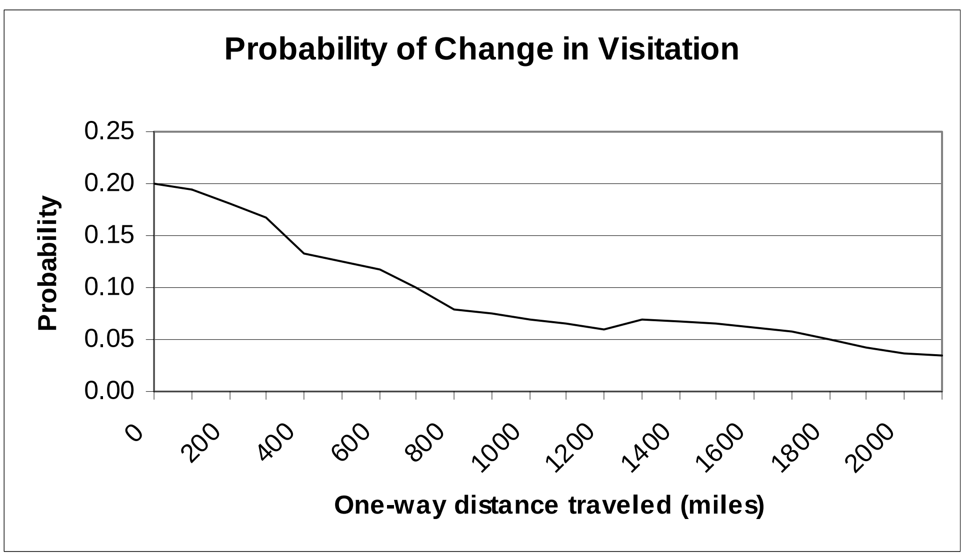

FIGURE 4. Probability of a Contingent Change in Visitation Behavior by Distance Traveled

TABLE 3

Binary Logit Model for CVM Analysis

Variable		Coefficient	z-Statistic
Intercept term		-2.679648	-1.960593
Bid Amount ($)	*	-0.006505	-6.281274
Temperature (°F)	*	0.028407	1.688469
Precipitation (inches)	*	4.446690	2.408470
Picnic (= 1 if participated)	*	0.410945	1.949570
Drive Trail Ridge Road (= 1 if participated)	*	0.370858	1.681791
Distance traveled (miles)	*	0.001935	6.438810
Distance traveled, squared (miles^2)	*	-2.62E-07	-4.390011
Income	*	9.04E-06	3.817378

Log likelihood = -286.6003
McFadden R^2 = 0.201,*significant at or above 90%

Utilizing Cameron's (1988) reparameterization approach to calculate an equation that relates willingness to pay to weather, activity, travel distance, and demographic variables, the slope coefficients from the specified logit model (Table 3) were reparameterized by dividing the intercept and all coefficients (other than that on the bid amount) by the coefficient on the absolute value of the bid amount. This conversion for the logit model generates the following equation:

$$WTP = -411.95 + 4.37TEMP + 683.60PPTAMT + 63.18PICNIC + 57.01\,DTRROAD + 0.30\,DIST - 4.03\,\bar{e}^{5}\,DISTSQ + 0.0014INC. \quad (6)$$

The specification in Equation (6) allows that parameters be interpreted in the same manner as ordinary least squares results—that is, a $1,000 increase in income is associated with an increase in WTP of $1.40.

Mean net WTP was calculated using the mean values for each of the explanatory variables and is estimated to be $314.95 per trip for the pooled model. Based on survey results that indicated an average group size of 4.3 persons and an average length of stay of three days, net WTP per person per day is $24.47.

In order to more closely examine the effect of distance traveled on willingness to pay, WTP per trip was estimated for varying travel distance. Coefficient estimates from the reparameterized WTP equation were applied to mean values of explanatory variables (including distance-related variables at 100-mile increments). Figure 5 illustrates that net WTP per trip increases with one-way travel distance, from approximately $156 for visitors traveling 100 miles or less to nearly $700 for long-distance travelers. This is likely associated with differences in trip planning and length of stay across the sample—visitors who traveled more than 200 miles one-way (mostly out-of-state) stayed at RMNP for an average of 4.4 days; nearby visitors (traveling 200 miles or less one-way) tended to take more day trips—average length of stay was 1.3 days. Table 4 indicates that marginal net WTP for long-distance visitors (with travel distance greater than 200 miles) was $423.40, more than 2.6 times higher than that of nearby or in-state visitors ($159.64) who traveled 200 miles or less. These results indicate that the marginal park visit is more valuable to visitors traveling longer distances, which suggests a broader national value of the natural resources and recreation opportunities afforded by federal lands. However, visitors who live nearby visit RMNP more frequently (5.9 trips per year) than long-distance visitors (1.2 trips per year). Therefore, nearby visitors accrue higher annual benefits from recreation visits because of greater trip frequency (see Figure 6), which is supported by the revealed preference of residential location.

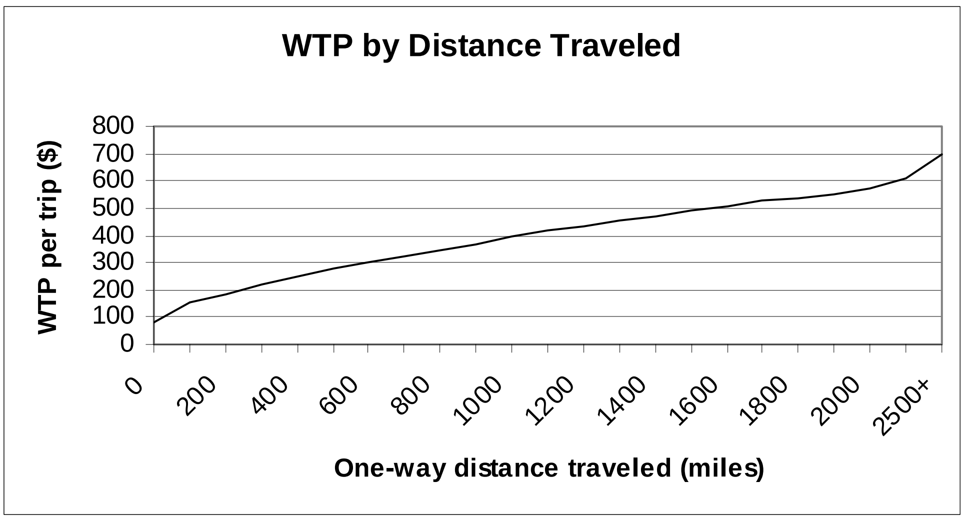

FIGURE 5. Willingness to Pay per Trip by Distance Traveled

TABLE 4

Average Annual Recreation Benefits for Nearby and Long-Distance Visitors

Visitor Category	Average Distance	Mean Net WTP Per Trip	Average # of Annual Trips	Average Annual Benefits
Nearby visitors (one-way distance < 200 miles)	66.0	$159.64	5.9	$946.07
Long-distance visitors (one-way distance > 200 miles)	1,190.2	$423.40	1.2	$525.42

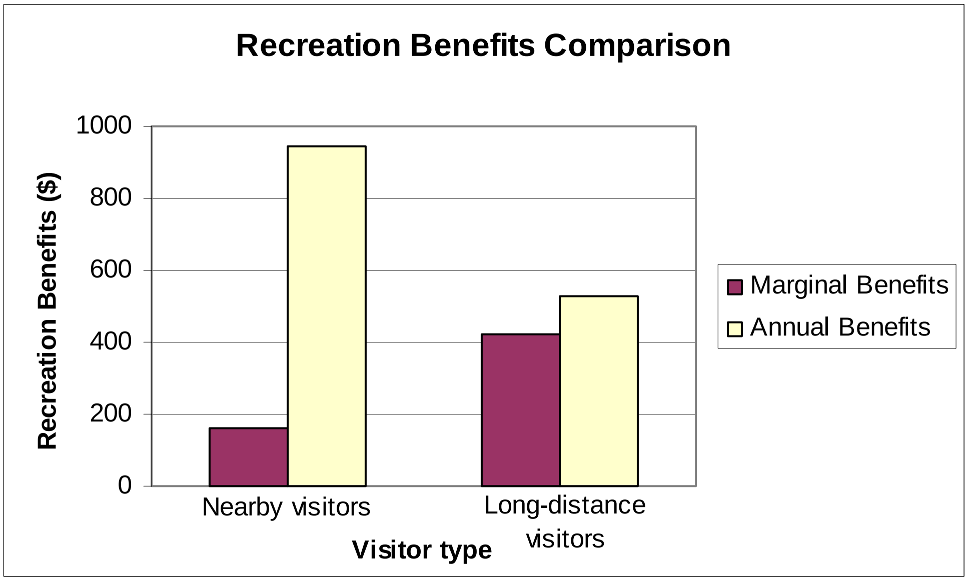

FIGURE 6. Marginal and Annual Benefits for Nearby and Long-Distance Visitors

6. CONCLUSIONS

The average distance traveled to RMNP was 643 miles, the average length of stay was more than three days, and over 60 percent of respondents were from outside of Colorado. In this context, visitation behavior and variation in recreation benefits based on distance becomes of considerable interest to park and community planners, as well as an intriguing question of spatial effects on consumer decision-making. Does the recreational "good" vary by the distance the consumer must travel to enjoy it?

Long-distance visitors (traveling more than 200 miles one-way) planned their trips well in advance (96 days on average) and stayed longer (4.4 days), while short-distance travelers (traveling a one-way distance of 200 miles or less) did less advance planning for park visits (27 days on average) and were more likely to take day trips (average length of stay was 1.3 days). Regression results indicate that longer-distance visitors were much less affected by variations in climate and park resources in their visitation decisions and were also significantly influenced by alternative recreation possibilities. Therefore, recreation destinations, parks, and communities whose visitor market is mostly long-distance or from out-of-state, such as those without nearby metropolitan areas, are likely to have more stable visitation patterns even in the face of changes in natural resources such as drought or forest fires. However, such sites are also likely to be more sensitive to the opening of more proximate recreational opportunities. Site designation such as national park, national monument, or wilderness area may then play a further role in determining the visitation tradeoffs (Weiler and Seidl 2004; Loomis 1999).

In addition to having more resilient visitation patterns, long-distance visitors appear also to derive higher benefits per trip from the recreational experience based on normalized measures. For RMNP, long-distance visitors (largely from out-of-state) traveling more than 200 miles placed more than twice the value on the per-day experience than local visitors; however, nearby (or in-state) visitors traveling 200 miles or less accrue higher annual recreation benefits from the site that equate to approximately 1.8 times the average annual benefits for long-distance visitors. Higher annual benefits for Colorado residents support their revealed preference for the recreational amenity afforded by RMNP and the mountain region more generally as expressed by their residential location. Despite being compared to consumers who are likely to value such amenities to a considerable degree, longer-distance visitors nevertheless value the marginal trip more highly. In this way, this paper's findings suggest the broader national value of public lands' recreational resources, where even visitors who reside far from the area (and comprise the majority of park visits) highly value the resource.

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