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Stated Choice Models for Predicting The Impact Of User Fees at Public Recreation Sites

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A crucial question in the implementation of fee programs is how the users of recreation sites will respond to various levels and types of fees. Stated choice models can help managers anticipate the impact of user fees on people's choices among the alternative recreation sites available to them. Models developed for both day and overnight trips to several areas and types of sites in the Midwest have included user fees as one of the site attributes used to predict choices. Two of these models are presented to illustrate how stated choice models can help assess the impact of fee changes on the likelihood of choosing a site, and the importance of fees relative to other site attributes in people's choices.

KEYWORDS: *Recreation, fees, choice models, logit*

Introduction

Faced with shrinking dollars for managing recreation sites, public land agencies are looking more and more to user fees to raise the funds needed to maintain and improve sites and facilities. In 1996, Congress authorized a 4-year demonstration program to test the effectiveness of using recreation fees for maintaining facilities and enhancing visitor services and wildlife habitat at sites managed by 4 federal agencies: the National Park Service, the U.S. Fish and Wildlife Service, the Bureau of Land Management, and the USDA Forest Service. By the end of 1997 more than 200 individual fee demonstration projects had been initiated by these agencies (*Recreational Fee Demonstration Program,* 1998).

An important question in the implementation of fee programs is how various levels and types of fees will affect people's decisions about whether and how often to visit particular sites. Common sense indicates that if fees are raised high enough people will reduce their use of the site. It is not necessarily easy to anticipate, however, how high fees can be raised before significant impacts on use will occur, or how those impacts will vary across sites and across users. To further complicate matters, increases in fees may have indirect effects on use, since they may lead to other changes at a site. Some of these changes may be planned as part of the fee implementation

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program, as when fee revenues are used to improve maintenance and upgrade facilities. Other changes may be less deliberate. For example, the social character of the site (types of users, types of activities, length of stay, and so on) may change as people alter their visitation patterns and activities in response to the fees. Changes such as these may have further effects on people's choices, either augmenting or offsetting the direct effects of fees per se.

Initial evaluations of the Recreational Fee Demonstration Program suggest that the fee levels implemented in demonstration projects so far may not be having a great effect on visitation. In a survey of visitors to National Forests near Los Angeles, 39 percent of the respondents said that the fee program would not impact their amount of use of the forests, while only 16 percent said it would (Gable et al. 1997). One year after the fee demonstration program began, visitation data compiled from demonstration sites did not provide any clear evidence that fees had caused overall decreases in use. The National Park Service did report, however, that the sites most likely to experience decreased use included lesser known sites with low levels of visitation and sites used mostly by surrounding communities (*Recreational Fee Demonstration Program,* 1998).

It is too early to know whether these findings will still hold at the end of the 4-year demonstration period. In any case, whether or not the fees implemented during the demonstration program have a discernible impact on visitation rates overall, managers still need to be able to anticipate how future changes in fees and consequent changes in other attributes at particular types of sites are likely to impact people's choices about where and how often to recreate.

One research method that may be helpful in addressing this question is recreation site choice modeling. The purpose of this paper is to describe an approach to choice modeling that has been applied to several different types of recreation sites, and to explain how it can be used to anticipate the impacts of recreation fees on people's choices of sites. Selected results from two recreation site choice models will be presented to illustrate the kinds of information that choice models can yield about the impact of fees. Limitations on the use of these models will be discussed, and some directions for future research efforts will be suggested for creating recreation choice models that are better able to address the implications of imposing fees at recreation sites.

General Approach to Choice Modeling

In general, choice models assume that people base their choices of which recreation sites to visit on the attributes (i.e. characteristics or features) of the sites. Some examples of attributes that might influence people's choices are the size of the recreation area, the kind of overnight accommodations available, the type of vegetation and terrain, the naturalness of the surrounding area, the travel distance from home to the site, the types of

other people at the site, and the amount of fees being charged. Each site attribute included in a choice model is defined in terms of two or more distinct levels that it can assume. For example the attribute "overnight accommodations" might have the levels "none," "tent sites," and "cabins." The attribute "type of vegetation" might have the levels "open grassy fields," "grass with scattered trees," and "mostly wooded." A description of a recreation site then consists of a list of the attribute levels that apply to that site.

The collection of all the sites available to a recreationist for a particular outing is called the choice set. The purpose of a choice model is to estimate how likely people are to choose each of the sites in the choice set. It does this by assigning a coefficient to each attribute level in the model to indicate how much that attribute level contributes to the utility (i.e. the desirability or attractiveness) of a site. The total utility of the site is assumed to be the sum of the utilities of the individual attribute levels it comprises. Sites with higher total utility are assumed to be more preferred than sites with lower total utility.

The final step is to convert the site utilities for all the sites in the choice set into a prediction of the likelihood of people choosing each site. One way of doing this is with a mathematical formula called the logit transformation. The logit transformation converts each site's utility into a choice probability, that is, a number between 0 and 1. A probability of 0 means that a person would never choose that site, and a probability of 1 means that they would always choose that site. The probabilities for all the options in the choice set must sum to 1, reflecting the fact that for a given outing a person must choose one and only one option from the set. In some choice models the choice set includes an option of "none of the above," to reflect the fact that if these were the only sites available, the person might choose to not go on a recreation outing at all.

The utility coefficients, which are the heart of the choice model, can be derived in several ways. One approach is to observe (or ask people to report) actual choices to visit real recreation sites. Models developed from this kind of data are called revealed preference or revealed choice models. An alternative approach is to ask recreationists to express their preferences for hypothetical recreation sites that are described in terms of a predefined list of attributes. This approach is called stated preference modeling or conjoint analysis (Louviere 1988). There are several different ways in which preference data can be gathered for conjoint analysis. In the models to be presented in this paper, people were presented with sets containing descriptions of several recreation sites and were asked to pick the one site from each set that they would most like to visit. Conjoint models developed using this method are called stated choice models. Reviews of the theory behind revealed and stated choice modeling and their application to recreation choice have been provided by Stynes and Peterson (1984) and Louviere and Timmermans (1990).

When fees are included as an attribute in a choice model it becomes possible to examine the impact of fee changes on people's choices and to

compare the impact of fee changes with the impact of changes in other site attributes. Choice models can therefore be employed as an alternative to the contingent valuation methods often used by economists to assign monetary values to nonmarket benefits. Several studies have used fees or other payment vehicles in stated preference models as a means for measuring the values of other site attributes (Dwyer et al. 1989, Schroeder et al. 1990, Adamowicz et al. 1994, Adamowicz et al. 1998, Zinkhan et al. 1997). In this article, however, the focus is not on valuation of site attributes by means of hypothetical fees, but on using choice models to predict the impacts of implementing actual fees at recreation sites.

Examples of Stated Choice Models with Fees

Over the last 15 years, stated choice models for several types of recreation sites have been developed for the USDA Forest Service by Jordan Louviere and his colleagues. The types of sites considered in these models include parks and forest preserves used for day trips, overnight camping sites, cabins, resorts, lodges, and bicycle trails. The process for developing all of these choice models involved the same general steps. First, a list of attributes that were managerially relevant and that seemed likely to influence choices was selected. The selection was based on Forest Service Research staff's knowledge of recreation opportunities in the Midwest, earlier research studies, consultations with recreation site managers, information from preliminary surveys, and focus groups of recreationists.

Next, levels were defined for each attribute, representing the range of conditions likely to be encountered in the types of sites being modeled. Then the different attribute levels were combined into descriptions of hypothetical recreation sites. To the extent possible, the attributes and their levels were defined in such a way that levels could be combined at random without giving rise to highly implausible or contradictory site descriptions.

Because of the large number of attributes and levels in these models, generating all possible combinations of attribute levels would have resulted in too many site descriptions for survey respondents to evaluate. Therefore, special experimental designs called fractional factorials were employed. These designs allow for unbiased statistical estimation of the main effects of the attributes from a smaller subset of site descriptions, provided that there are no higher order interactions among attributes (Green 1974, Louviere 1988).

Choice sets consisting of two or more hypothetical site descriptions, along with an option of not going to any of the available sites, were then created. A series of these choice sets was presented to each respondent in a mail survey. For each choice set, the respondents were asked to pick the one option that they would select if these were the only sites available to them. Based on the survey responses, utility coefficients for all attribute levels in the model were estimated using multinomial logit regression analysis procedures based on maximum likelihood estimation.

To be useful, stated choice models ultimately need to be validated against people's actual choices of real recreation sites. In most of the choice model studies conducted by Louviere and his associates for the USDA Forest Service, external validity tests of various sorts were conducted, with generally positive results. The most rigorous test was carried out in a choice model for ski areas in Utah (Louviere & Anderson 1994), and provided strong evidence that a stated choice model could in fact accurately predict people's choices of actual ski areas.

The remainder of this paper presents some results from two stated choice models developed for recreation sites in the Midwest. Both of these models incorporated user fees as one of the site attributes. The technical details of these models and the methods by which they were developed will not be presented in great detail. Rather, the purpose is to illustrate how such models may be used to anticipate the impact of changing fees on people's choices. The types of sites and areas of the Midwest to which the models apply, and the fee levels considered in each model are summarized in Table 1.

The Chicago Model

The first model is based on a 1986 survey of Chicago-area residents conducted by the University of Iowa (Louviere et al. 1986). A sample of 525 respondents was randomly drawn from telephone directories for the northwest portions of Chicago and Cook County, IL. An initial letter to respondents described the purpose of the study, informing them that they had been

TABLE 1
Summary of Two Stated Choice Models

	Chicago Model	Lake States Model
Region	Chicago Metro Area	Northern Great Lakes
Year	1986	1990
Type of Sites	Day-use recreation sites	Campgrounds
Fee Levels*	Entry fee:	Nightly camping fee:
	$0 ($0)	$6 ($7.38)
	$1 ($1.45)	$9 ($11.07)
	$2 ($2.90)	$12 ($14.76)
	$3 ($4.35)	$15 ($18.45)
Respondents	Residents of NW Chicago and adjacent Cook County	Residents of Milwaukee, Green Bay, Minneapolis-St. Paul, and Duluth metropolitan areas
Sample Size	210	517
Response Rate	74%	63%

*Inflation-adjusted equivalents (1997 dollars) are shown in parentheses, based on the Consumer Price Index for Midwest urban areas.

chosen at random to participate and would be contacted by telephone within 7-10 days. In the telephone interview, questions were asked about the respondents' park and forest preserve use patterns and about several socio-demographic classifiers. Phone surveys were completed with 302 individuals for a response rate of 58 percent. Of these individuals, 285 or 94 percent agreed to participate further and were mailed a choice survey consisting of 16 pairs of park descriptions. These were based on a set of 22 park and forest preserve attributes found to be important in earlier research on park choice (Table 2). Respondents were instructed to read each pair of park descriptions and to decide which one of the parks they would prefer for an outdoor day trip in the Chicago area. Respondents were then asked whether they would prefer to go to the park they had chosen or to do some other outdoor activity (e.g., go to the zoo, the botanical garden, or a ball game) instead. The instructions and an example of one of the choice pairs are shown in Figure 1.

Useable mail surveys were returned by 210 respondents, for a response rate of 74 percent. Multinomial logit regression analysis was used to estimate utility coefficients for each level of each attribute. The utility of fees was modeled as a quadratic function of fee level, i.e. a linear and a quadratic coefficient were estimated which could then be used to calculate the utility of any fee level within the range included in the model. The model coefficients for the entire sample are shown in Table 2. In addition to analyzing the choices of the sample as a whole, cluster analysis was used to identify subgroups or segments of respondents who were similar in their park visitation patterns and socio-economic characteristics. Separate analyses were then performed to estimate utility coefficients for each of the five largest segments. The characteristics of these segments are summarized in Table 3.

The Lake States Model

This model is based on a two-phase mail survey concerning recreation site use and preference in the upper Great Lakes region, conducted in 1990 by the University of Wyoming (Anderson & Louviere 1993). In the first phase, surveys were mailed to 3000 randomly selected households, 750 in each of four urban areas—Milwaukee, Green Bay, Minneapolis-St. Paul, and Duluth. Of these, 295 were returned by the post office as undeliverable and 893 were completed satisfactorily, giving a response rate of 33 percent.

In the first-phase survey, respondents were given descriptions of general types of recreation areas and opportunities described in terms similar to the Recreation Opportunity Spectrum planning system used by the USDA Forest Service (Driver et al. 1987). Respondents were asked to choose which kinds of areas they would most like to visit. Cluster analysis was used on these responses to divide the total sample into three segments. The high-development segment preferred areas in towns or resort locations with many modern facilities and services available. The medium-development segment preferred more rustic or natural areas, but with some developed services

TABLE 2
Attributes, Levels, and Utility Coefficients in the Chicago Model

Attributes	Levels	Utility Coefficients (entire sample)
VEGETATION*	mowed grass, very few trees	0.000
	no woods, mowed grass, scattered trees	0.056
	some woods, mowed grass, scattered trees	0.270
	mostly wooded, some grass under trees	0.370
TERRAIN*	mostly flat	0.000
	rolling hills, some flat areas	0.112
WATER*	none	0.000
	small stream or pond	0.462
	large stream or river	0.390
	large lake	0.490
GRASS*	needs mowing	0.000
	recently mowed	0.090
MAINTENANCE*	facilities need repair	0.000
	facilities well-maintained	0.134
VANDALISM*	little	0.000
	lots	−0.844
LITTER*	little	0.000
	lots	−0.722
CROWDING*	very few people	0.000
	some people	−0.146
	people almost everywhere	−0.544
	very crowded	−1.148
USERS*	families and older adults	0.000
	teenagers and young people	−0.418
ETHNICITY*	mostly like yourself	0.000
	mixed	−0.198
PATROLS	few, rarely seen	0.000
	regular, highly visible	−0.002
PICNIC AREAS*	yes	0.348
	no	0.000
PICNIC SHELTERS*	yes	0.296
	no	0.000
HIKING TRAILS*	yes	0.220
	no	0.000
BIKE TRAIL*	yes	0.360
	no	0.000
SWIMMING POOL*	yes	0.205
	no	0.000
BOAT LAUNCH SITE*	yes	0.198
	no	0.000
FISHING*	yes	0.146
	no	0.000
PLAYGROUNDS*	yes	0.220
	no	0.000

TABLE 2 (Continued)

Attributes	Levels	Utility Coefficients (entire sample)
ATHLETIC FIELDS*	*yes*	0.150
	no	0.000
ENTRY FEE*	$0	0.000
	$1	−0.272
	$2	−0.434
	$3	−0.486
TRAVEL TIME*	15 minutes	0.000
	35 minutes	−0.228
	55 minutes	−0.532
	75 minutes	−0.192

*Effect of attribute on choices is statistically significant ($p < .05$).

nearby. The low-development segment preferred very natural areas with opportunities for solitude and only limited recreational developments. Table 4 shows what types of recreation areas the three segments had visited and what kind of accommodations they had used on their most recent overnight recreation trips.

In the second-phase survey, the 893 people who had participated in the first phase were asked to make choices among sets of hypothetical recreation

INSTRUCTIONS ON HOW TO PLAY THE PARK GAME

THINK ABOUT A DAY WHEN YOU WANT TO DO AN OUTDOOR ACTIVITY in the Chicago area. On each page, you will be offered a CHOICE OF TWO PARKS that have different features. After reading the descriptions of the two parks (Park A and Park B), please pick the park that you find more desirable. Circle your choice at the bottom of each set of parks. Remember, there are no right or wrong answers in this game, only your personal preferences.

Next, CONSIDER WHETHER YOU WOULD PREFER SOME OTHER PLACE FOR AN OUTDOOR ACTIVITY rather than going to the park you selected. Some other places you might go are the zoo, the botanical gardens, or a baseball game. You may think of other outdoor places you might rather go. Circle your choice.

Please CIRCLE YOUR CHOICES ON EVERY PAGE. Each page is a different situation, so look at the park descriptions carefully before you make your choice. It is important to COMPLETE THE ENTIRE GAME. Incomplete forms cannot be used, so go back and check that you've circled choices on BOTH SIDES of every page. Then RETURN THE GAME IN THE ENCLOSED ENVELOPE.

We hope you will enjoy playing the Park Game. Your preferences are important for park/forest preserve management decisions. We thank you for making a commitment to help!

Figure 1A. Instructions for making choices in the Chicago survey.

SET 1

	DESCRIPTION OF PARK A	DESCRIPTION OF PARK B
VEGETATION:	Mowed grass, very few trees anywhere	Mostly wooded, some open grassy areas under trees
TERRAIN:	Rolling hills with some flat areas	Mostly flat
WATER:	No streams, rivers, ponds, or lakes	Large natural or man-made lake a major feature
OTHER FEATURES:	Picnic areas and tables	Picnic areas and tables
	No picnic shelters	Picnic shelters
	Hiking trails	No hiking trails
	Bicycling trails	No bicycling trails
	Swimming pool	No swimming pool
	Rowboat or canoe rental or launch site	No rowboat or canoe rental or launch site
	Fishing	No fishing
	No children's playgrounds	Children's playgrounds
	No improved facilities for athletics	Improved athletic fields and facilities
CROWDING:	Little traffic, very few people, many places for privacy and quiet	Lots of traffic, very crowded, no privacy, quite noisy
PEOPLE:	Mostly families and older adults	Mostly teenagers and young people
	Mostly ethnically and racially mixed	Mostly ethnically and racially like yourself
SECURITY:	Regular police patrols, highly visible	Few police patrols, rarely seen
	Lots of vandalism and/or graffiti	Very little vandalism and/or graffiti
MAINTENANCE:	Lots of litter or trash	Very little litter or trash
	Grass recently mowed	Grass needs mowing
	Structures and facilities well maintained	Structures and facilities need repair
TRAVEL TIME:	15 minutes travel time	75 minutes travel time
ENTRY FEE:	No entry fee	$3 entry fee

Which of these parks would you prefer on a day you wish to be outdoors? (Please circle your choice.)

PARK A PARK B

Thinking realistically, would you prefer the park you circled above or would you prefer some other place for an outdoor activity? Examples of other places might include the zoo, the botanical gardens, a baseball game, etc. (Please circle your choice.)

PREFER PARK ABOVE PREFER ANOTHER PLACE

Figure 1B. An example choice pair from the Chicago survey.

sites for a trip involving 2 to 3 nights. Each respondent was given 8 choice sets, consisting of 3 sites each plus the option of staying at home. The alternative sites were described in terms of environmental settings, facilities, and the character of the surrounding area (Table 5). The choice sets included sites with both campground and resort/cabin accommodations. The instructions and an example of one of the choice sets are shown in Figure 2.

Sixty-six of the second-phase surveys were returned by the post office as undeliverable and 517 were completed satisfactorily, giving a response rate of 63 percent. Based on people's choices among these sets of alternative sites,

TABLE 3
Respondent Segments in the Chicago Model

	Seg. 1	Seg. 2	Seg. 3	Seg. 4	Seg. 5
Percent of sample	48%	10%	12%	9%	11%
Chicago residents	42%	63%	61%	53%	52%
Visits to city park in last year*	3.06	3.33	19.65	41.5	47.5
Visits to county park in last year*	2.81	2.97	2.14	3.34	3.23
Visits to state park in last year*	0.37	0.47	0.48	1.29	0.47
Length of last park visit (hours)*	3.4	2.6	3.1	4.3	4.0
Number of persons in household*	2.89	1.74	3.32	3.18	3.42
Children under 6*	15%	0%	30%	35%	29%
Children 6-13*	16%	5%	35%	18%	14%
Children 14-21*	26%	11%	26%	12%	29%
Respondent age (median)*	40	44	39	34	33
Age of other adult (median)*	49	22	38	37	38
Native of City of Chicago*	47%	42%	43%	18%	67%
Native of Chicago suburbs*	27%	26%	30%	47%	19%
Education (years)*	13.97	15.02	16.16	15.18	15.87
Income ($1000)*	39.27	35.19	43.68	44.99	47.16
Female*	63%	93%	75%	81%	56%
Number of vehicles*	1.70	1.31	1.87	1.88	1.71

*Difference between segments is significant ($p < .05$).

utility coefficients were estimated for the various features and facilities of recreation sites. The utility of fees was modeled as a quadratic function of fee level. Distinct models involving somewhat different sets of attributes were developed for campsites and for resort/cabin sites. For the purposes of this article, only the campsite models will be reported. A model was estimated for the entire sample, and then separate models were calculated for the high-development, medium-development, and low-development segments. The utility coefficients from this model for the entire sample are given in Table 5.

Results from Site Choice Models

This section will discuss two main types of information about impacts of fees that can be obtained from a choice model. The first is the impact of a change in fees on a person's probability of choosing a site, and the second is how the impact of a fee change compares to the impact of changes in other site attributes.

Impact of Fee Increases on Choice Probability

Before the impact of a fee change on choice probability can be assessed, some initial assumptions must be specified. The choice probability predicted

TABLE 4
Respondent Segments in the Lake States Model

	High-Dev. Segment	Med.-Dev. Segment	Low-Dev. Segment
Percent of sample	35%	45%	16%
Number of one-night trips last summer*	1.405	2.402	2.476
Number of 2 or 3 night trips last summer	1.791	2.461	2.286
Number of 4 or more night trips last summer	0.868	1.280	0.988
Visited National Forest on last trip*	16.5%	32.9%	41.2%
Visited National Park on last trip*	21.4%	29.9%	17.7%
Visited State Park on last trip	42.3%	46.2%	41.2%
Visited private recreation area on last trip	26.9%	31.2%	22.4%
Accommodations on last trip:*			
hotel / motel	43.4%	29.1%	24.7%
cabin	10.5%	11.4%	13.7%
vacation home	11.9%	18.1%	11.0%
towed trailer RV	8.4%	7.1%	0.0%
self-contained RV	4.2%	7.1%	6.9%
tent	6.3%	11.4%	32.9%
friends / family	12.6%	13.3%	8.2%

*Difference between segments is significant ($p < .05$).

by a logit choice model for a particular site depends not only on the attractiveness of that site, but also on how many other alternatives are in the choice set and how attractive they are. (This includes not only the other recreation sites that are in the set, but also the option of staying home or doing something other than visiting a recreation site.) In general, the larger the choice set and the more attractive the alternatives, the smaller the choice probability will be for any one site within the set. Also, as the number and attractiveness of the other alternatives in the choice set increases, the proportional impact of a fee change at a given site will be larger. This characteristic of the logit transformation reflects the fact that people are more likely to change their use of one site if there is an attractive array of other alternatives available for them to choose from.

For the purpose of illustrating the choice models in this paper, we will assume that the choice set always consists of a large number of attractive alternatives. This assumption is a limiting case, somewhat analogous to the assumption of perfect competition in economic models. We are making this assumption simply to provide a consistent context for presenting the impacts of fees in these choice models. Depending on the circumstances, this assumption might not be appropriate if we were applying the models to specific sites in the real world. In any specific, real-world application of these models, an actual array of alternative sites and their attractiveness would need to be specified or at least approximated. If there are few attractive

TABLE 5
Attributes, Levels and Utility Coefficients in the Lake States Campground Model

Attributes	Levels	Utility Coefficients (entire sample)
SITE SETTING*	Heavily forested; no open grassy areas	0.367
	Mix of woods and open grassy areas	0.076
	Open grassy area with a few shade trees	−0.179
	Open grassy area with no shade	0.000
WATER FEATURES*	Lake with sandy beach	0.718
	Lake with no beach	0.160
	Small river, stream or creek	0.518
	No lake or stream in immediate area	0.000
GENERAL VICINITY*	National Forest within walking distance	0.000
	National Park or Lakeshore within walking distance	−0.660
	State Pk. or public rec. area within walking distance	−0.620
	Private recreation area within walking distance	−0.116
	National Forest a short drive away	−0.224
	National Park or Lakeshore a short drive away	0.016
	State Pk. or public rec. area a short drive away	0.008
	Private recreation area a short drive away	−0.380
DEVELOPMENT*	Primitive and natural, undeveloped	0.000
	Natural with limited development	−0.350
	Rural and rustic with historic sites or small towns	−0.023
	Relatively urban with commercial entertainment	−0.299
CAMPGROUND*	RV and tent; hookups, flush toilets, and showers	1.024
	RV and tent; flush toilets and showers	0.732
	RV and tent; hookups, pit toilets	0.368
	RV and tent; pit toilets	0.000
	Tents only; flush toilets, showers, drive to site	0.392
	Tents only; flush toilets, showers, walk to site	−0.548
	Tents only; pit toilets, drive to site	−0.318
	Tents only; pit toilets, walk to site	−0.546
CAMP SITES*	Visually separated; occasionally noisy & crowded	0.000
	Visually separated; usually uncrowded & quiet	0.514
	No visual separation; occasionally noisy & crowded	−0.552
	No visual separation; usually uncrowded & quiet	0.178
NIGHTLY CAMPING FEE	$6	0.000
	$9	−0.090
	$12	−0.054
	$15	0.108
TRAVEL DISTANCE*	50-100 miles	0.000
	125-175 miles	−0.020
	200-250 miles	−0.329
	275-325 miles	−0.654

*Effect of attribute on choices is statistically significant ($p < .05$).

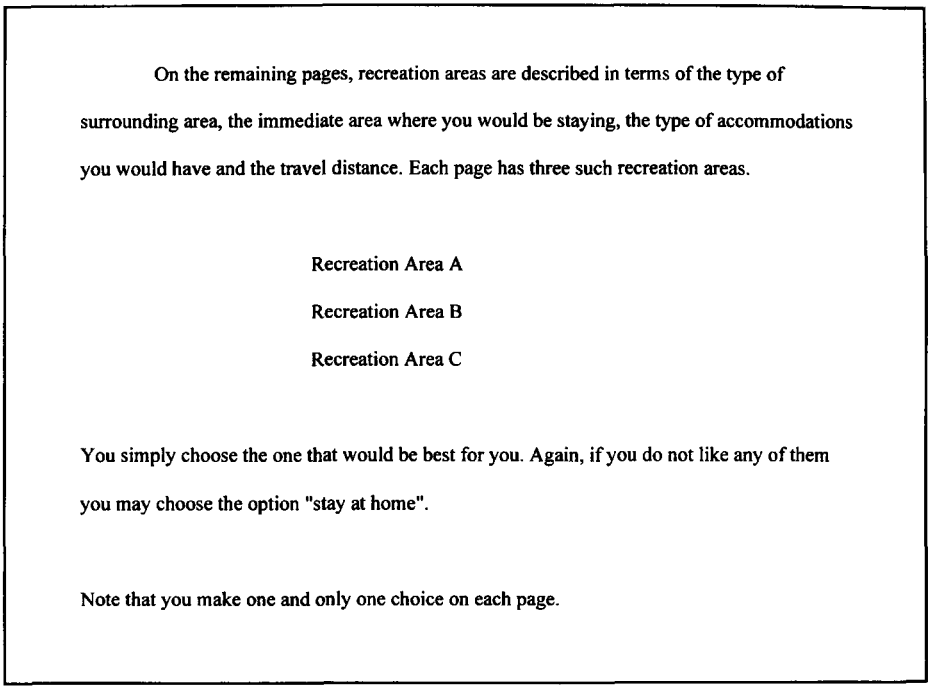

Figure 2A. Instructions for making choices in the Lake States survey.

alternatives in the choice set, then the predicted impact for a given fee change at a site will be smaller than what is presented in this paper.

We will assume that the fee at one recreation site is initially at the lowest level of the fee attribute that was included in the choice model, and will use the model to predict how the choice probability for that site would change if the fee were increased to the higher levels of the fee attribute. We assume that the other attributes of that site, the attributes (including fees) of other sites, and the attractiveness of doing something other than visiting a recreation site all remain unchanged. The impact on choice probability of raising the fee at one site to a higher level will be reported as a percent change from the choice probability for that site at the initial fee level.

The Chicago Model. The effect of a fee increase from 0 to 3 dollars on choice probability for a day-use site in the Chicago model is shown in Figure 3, with the entire sample and each segment of the sample plotted as separate lines. For the entire sample, entry fees had a significant impact ($p < .05$) on choices of recreation sites, with choice probability showing a steady drop over the entire range of fee levels. At a fee of 3 dollars, the choice probability for the entire sample decreases by almost 40 percent.

The picture becomes more complex when the impact of fee increases are examined for the 5 segments of the sample. Segments 1 and 3 show the

	RECREATION OPPORTUNITY A
Camp Ground:	RV and tent sites: no electricity, but has flush toilets and hot showers, $9.00 per night
Camp Sites:	No visual separation from other sites, occasionally noisy and crowded
Site Setting:	Heavily forested with no open grassy areas, and lake with no beach
General Vicinity:	National Forest a short drive away, primitive and natural, undeveloped, rough paths, quiet with few other people
Travel Distance:	125-175 miles
	RECREATION OPPORTUNITY B
Accommodations:	Resort Lodge/Hotel, swimming pool, tennis, restaurant, $85-$95 per night double occupancy
Resort/Cabin Site:	Located on a paved highway with little traffic
Site Setting:	Open grassy area with a few shade trees, and no lake or stream in the immediate area
General Vicinity:	State Park or Public Recreation Area a short drive away, rural and rustic with historic sites or small towns, craft/antique stores and other shops, may be crowded
Travel Distance:	275-325 miles
	RECREATION OPPORTUNITY C
Camp Ground:	RV and tent sites: electrical hookups, pit toilets, no showers, $15.00 per night
Camp Sites:	Visually separated from other sites, usually uncrowded and quiet
Site Setting:	Heavily forested with no open grassy areas, and lake with sandy beach
General Vicinity:	National Forest within walking distance, relatively urban with commercial entertainment, amusement parks, cultural events, shops, often crowded
Travel Distance:	275-325 miles

Suppose the recreation opportunities described above were the only ones available for a trip or outing involving 2-3 nights (including travel).

Please circle the one you would most likely choose.

A B C Stay at home

Figure 2B. An example choice set from the Lake States survey.

same kind of steady drop over the range of fee levels as occurs for the entire sample. The other 3 segments show a less intuitive response as the fee increases. For two of these segments (2 and 4), the fee causes the choice probability to go down at first, but then to increase again when the fee reaches its highest value of 3 dollars. For segment 5, there is a steady but small increase in the choice probability across the whole range of fee increases. The difference between the impact of fees on a segment and the

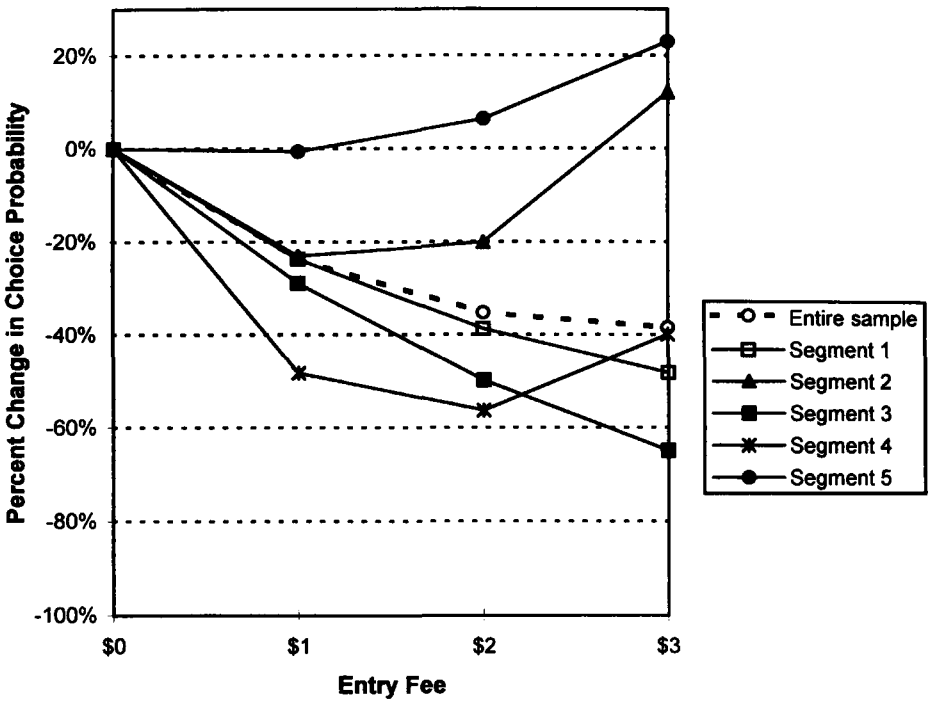

Figure 3. Impact of entry fee on choice probability in the Chicago model.

impact on the entire sample was statistically significant for two of the segments: segment 3 was significantly more impacted by fees than the entire sample, and segment 5 was significantly less impacted.

For segments 2 and 5, the highest fee level actually appears to be slightly preferred to no fee at all. In terms of socioeconomic background, park visitation patterns, and attribute preferences, these two segments are quite different from each other (see Table 3). It is not immediately clear why both of these segments would show a positive rather than a negative response to fees.

The Lake States Model. Figure 4 shows the impacts of a fee increase as predicted by the coefficients of the Lake States campground model. Unlike in the Chicago model, the impact of nightly camping fees on choices in this model was not significantly different from zero at the .05 alpha level. Thus, while the utility coefficients for fees in this model represent the best estimates of the impact of fees on choices that can be made from this data set, they must be interpreted with caution.

For the entire sample, the predicted choice probability drops slightly at the initial levels of a fee increase, but then actually increases by about 10 percent at the highest fee level of 15 dollars. For the segment consisting of users oriented toward highly developed recreation opportunities, the model

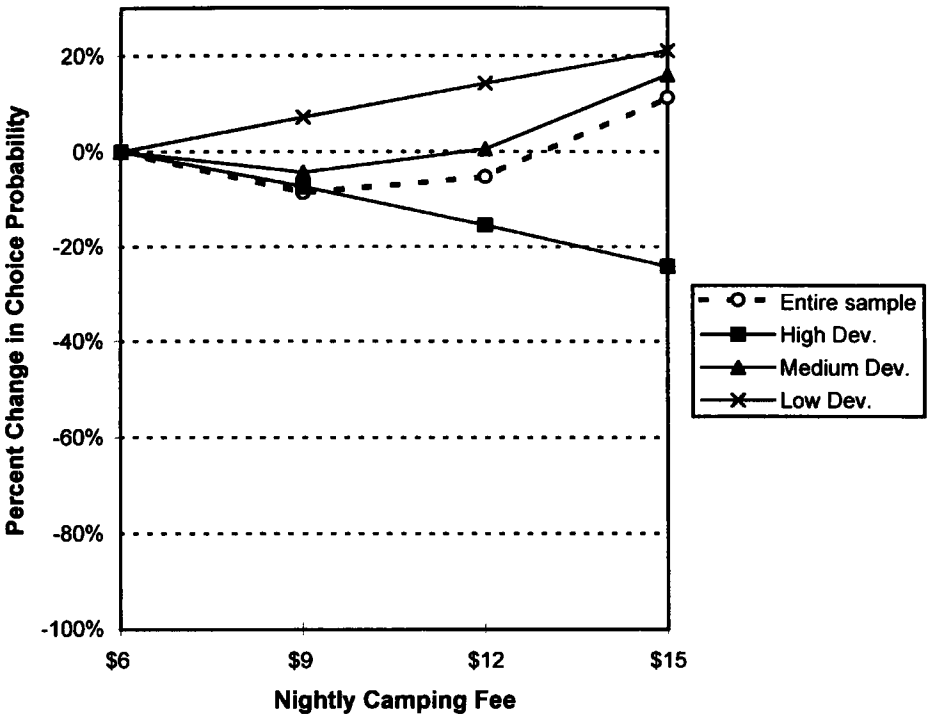

Figure 4. Impact of nightly camping fee on choice probability in the Lake States model.

does predict a negative impact of fees on choice probability. An increase in fee from six to fifteen dollars reduces choice probability for this segment by a little over 20 percent. For the two segments that are oriented toward less developed recreation opportunities the model predicts an increase in choice probability of about 20 percent with a 15-dollar fee. The impact of fees on choices did not reach statistical significance for any of the individual segments, however. Thus, although the model seems to suggest that people looking for a more developed style of recreation would be the most likely to reduce their use of a campsite when the fee is raised, fees clearly do not have as big an impact on choices in this model as in the Chicago model.

Comparison of Fee Increases with Changes in Other Site Attributes

Choice models can also provide information on how the impacts of fee changes compare to the impacts of changes in other site attributes. This information could be very useful to managers when fee increases are part of a management program that will also include changes in other site attributes. For example, if revenues from a fee increase are to be used to improve

maintenance of a site, a choice model may help determine whether the impact of the increased cost on people's choices will be offset by the improved quality of the site. This comparison can be made either by using the model to predict choice probabilities for different combinations of fee and attribute changes, or by directly comparing the utility coefficients for the attribute levels in question. Since the utility coefficients reflect the contribution of each attribute level to the overall attractiveness of the site, the change in attractiveness due to a change from one level of an attribute to another can be calculated by subtracting the utility coefficient for the initial level of the attribute from the coefficient for the level that the attribute is changed to. To illustrate, comparisons will be made below using the utility coefficients for selected attributes from the Chicago and the Lake States choice models, for those segments that showed a negative impact on choices at the highest level of fees.

The Chicago Model. In Figure 5, the impact of a fee change is compared to the impact of changes in 3 other attributes that had statistically significant effects on choices in the Chicago model. These comparisons are made separately for the 3 segments that showed a negative impact of a 0-to-3-dollar fee increase on choice probability.

Segment 1 is the largest segment and comprises almost half the respondents in the survey (Table 3). For this segment, a change in fee between 0 and 3 dollars has over twice as much impact on site attractiveness as a change in facility maintenance from "need repair" to "well-maintained". Thus maintenance improvements alone would not appear to be enough to compensate for a fee increase of this size for this segment, nor would the fee increase be offset by a shift in users from "teenagers and young people" to "families and older adults". The fee change would, however, be more than compensated for if it resulted in the elimination of "very crowded" conditions at the site.

For segment 3, the relative impact of a fee change compared to the other 3 attributes is similar to segment 1, except that this segment is more sensitive to fees and a little less concerned about facilities maintenance. For segment 4, on the other hand, an improvement in facility maintenance would completely compensate for a fee increase of 3 dollars, and if the fee resulted in the elimination of very crowded conditions it would be seen as a very positive change.

The Lake States Model. In Figure 6 the impact of a change in nightly camping fee from 6 to 15 dollars is compared with changes in crowding and developed facilities at a campsite. The comparison is made for the respondent segment that prefers high-development recreation opportunities, which was the only one that showed an overall negative impact of fees in this model. Although the effect of fees on choices was not statistically significant in this model, the other 3 attributes in Figure 6 all had significant effects on choices.

For the high-development segment, the model predicts that an increase in fee from 6 to 15 dollars would be more than compensated for by the elimination of noise and crowding, the provision of electrical hookups for recreational vehicles, or the provision of flush toilets and showers instead of

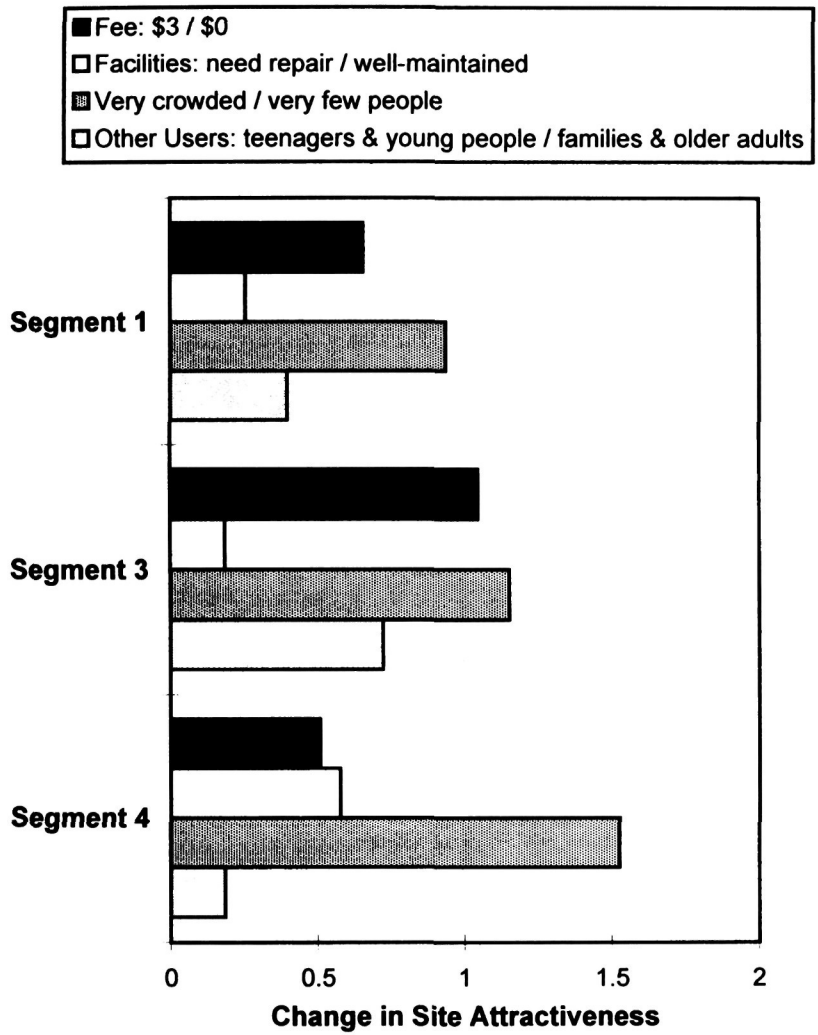

Figure 5. Comparison of the impact of a fee change with the impact of changes in other site attributes in the Chicago model.

only pit toilets. This segment has an especially strong preference for modern toilet and shower facilities, and would apparently be more than happy to pay an increased fee of this magnitude if it led to this level of modernization of the campsites facilities.

Discussion

The results presented above suggest that fee increases in the ranges represented in the models would have negative impacts on at least some of

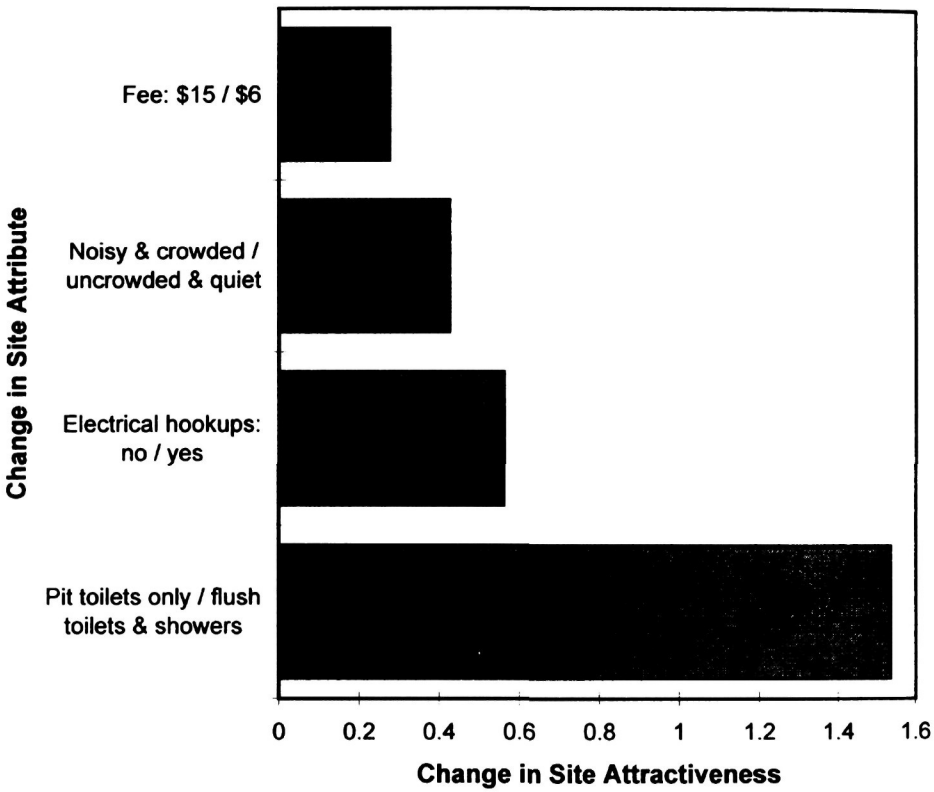

Figure 6. Comparison of the impact of a fee change with the impact of changes in other site attributes in the high-development segment of the Lake States model.

the respondents. The effects of fees are stronger and more statistically reliable in the Chicago model than in the Lake States model. In the most extreme case, for one of the respondent segments in the Chicago model, a fee increase of 3 dollars reduced the choice probability by over 60 percent. More typically, for the types of sites represented in the Chicago model, a fee increase of 3 dollars reduced choice probabilities by about 40 percent. For the segment that was negatively impacted by fee increases in the Lake States model, a nightly campground fee increase from 6 to 15 dollars only reduced choice probabilities by about 20 percent. Even taking into account the effects of inflation, it is clear that the Chicago model exhibits larger impacts from smaller fee increases than the Lake States model.

Since the Chicago model represents sites that are closer to home and are used for shorter visits than the sites in the Lake States model, it is understandable that they would be more strongly affected by fee increases. People are probably more willing to accept a substantial fee for a site that they have traveled a considerable distance to reach and where they intend

to spend a longer period of time. In this respect, the differences between the models are consistent with the preliminary finding reported in the *Recreational Fee Demonstration Program* (1998), that National Park Service sites used mostly by local communities were among those most likely to experience decreases in use one year after fees were introduced. It is also possible that people accept higher fees at campgrounds because they are already accustomed to paying such fees at that kind of site, while they may be less used to having to pay to visit more general-use city and county sites that are closer to home.

The models also suggest that some segments of the population may be more affected by a fee increase than others. Different segments in the Chicago model were differently affected by fees, but these differences were not easy to explain in terms of the socio-demographic characteristics of the segments. In the Lake States campground model there is some evidence that users oriented toward more highly developed recreation opportunities may be the most sensitive to fee increases at campsites. The high-development segment is the only one that is negatively impacted by a fee increase. As campground fees increased in this model, users who were inclined toward more developed recreation opportunities may have been more willing to shift their choices to modern accommodation types, such as resorts or hotels, than were users who were oriented toward more rustic recreation.

In both the Chicago and the Lake States models, some groups showed an increase in choice probability at the highest fee levels. There could be several explanations for this non-intuitive result. It is possible that these segments were actually indifferent to these fee levels and that the small positive increases in preference indicated by the coefficients were simply a result of random variation in the data. The positive impact of fees might also be an artifact of the fractional factorial design of the choice experiments. To reduce the number of scenarios that survey participants must respond to, a fractional factorial design selects a subset of the possible combinations of attribute levels in such a way that unbiased estimates of the main effects of all attributes can be calculated. The cost of reducing the set of scenarios in this study was that the main effects of attributes were confounded with some third- or higher-order interactions among attributes. This means that if specific combinations of 3 or more attributes had effects on choices beyond what would be expected from their main effects, those effects could have been mistakenly attributed to the main effects of attributes, perhaps resulting in biased coefficients for some of the attributes. The positive impact of fees might also be a spurious effect of using a quadratic function to model the utility associated with different fee levels. In order to get the best fit to all four of the fee levels, the quadratic function might in some cases have overestimated the utility of the highest fee level.

On the other hand, in at least some cases it is possible that the positive impact of fee increases in the models could indicate a genuine preference on the part of some people for sites with higher fees. In this case, it may mean that these respondents assumed that sites with higher fees would be

more likely to provide additional amenities or services beyond those that were explicitly mentioned in the choice survey. In a survey of California campers, More et al. (1996) found that increasing fee levels at campgrounds changes people's expectations of what amenities and facilities should be found at the site. For example, at a fee level of 6 dollars, only 12 percent of More et al.'s respondents expected there to be a small store selling food and other items at the campground, but at a fee level of 18 dollars, 48 percent expected there to be such a store. Since a camp store was not listed as one of the attributes in our choice models, respondents desiring this and similar amenities may have been assuming that they would be more likely to be found at a high-fee site. Similarly, respondents may have assumed that certain kinds of undesirable users, use levels, and behaviors would be less likely to be present at sites where higher fees are charged. In particular, this might be the case for segment 2 in the Chicago model, which was very averse to crowding and to the presence of teen-agers and younger users at a site; as well as for the primitive/wilderness segment in the Lake States model, which was also quite negative toward crowding.

The comparisons of fee coefficients with the coefficients of other model attributes show that the negative impact of fees on people's preferences may in some cases be offset by changes in other site attributes that could occur as a consequence of fee increases. For example, in both the models it appeared that a large reduction in crowding and/or noise accompanying a fee increase would be viewed as a favorable trade-off by many of the respondents to these surveys. Improvements in maintenance alone did not appear to be enough to compensate for fee increases of a few dollars in the Chicago model, but provision of modern toilet and shower facilities in the Lake States model would more than compensate campers for an increase from a 6-dollar to a 15-dollar fee at campsites.

Conclusions

These models illustrate the kinds of information that choice models can provide to recreation site managers who are considering implementing or increasing fees at their sites. This information could help managers anticipate the impact of fees on the choices of the people served by their sites, and to determine what kinds of changes in other site attributes might offset or compensate for the impact of fees on particular segments of the public.

In using the information from recreation site choice models, some limitations and cautions must be observed. These models may be used to predict the impact of management decisions for real recreation sites only if the model definition includes all of the attributes relevant to people's choices that are expected to vary between different management alternatives. The models' predictions may not be accurate if some of the sites in the choice set have unique features, qualities, meanings, or a "sense of place" that cannot be adequately described with a discrete list of attributes. However, even if an available choice model does not include all of the important features

of sites that will be impacted by a proposed management action, it may still be useful in providing a general idea of how the public values those attributes and features that are in the model.

The type of choice models described in this paper assume that all attributes in the choice process are compensatory, that is, that a decrease in the quality of one attribute can be offset or compensated for by changes in other attributes. It is possible, however, that some attributes of recreation sites may be non-compensatory. For example, RV campers might find it unacceptable to stay at a site that will not accommodate their vehicle, no matter what other positive attributes that site may offer. Evidence for non-compensatory attributes in the recreation site choice process has been reported by Timmermans and van der Heijden (1987) and Vining and Fishwick (1991). Site choice models such as the ones presented in this paper may give inaccurate results in some cases, if people are using non-compensatory decision processes.

In using this kind of stated choice model to assess the impacts of fees, it must also be assumed that people accept fees as an appropriate management policy for the kind of sites represented in the model. The models might not be appropriate for anticipating how the public will respond initially to imposition of new fees at sites where visitors have never had to pay fees before and where some people might consider fees to be inappropriate. Choice models such as the ones presented here are probably most accurate for evaluating changes in fee levels at sites where fees have already been established and people have become used to paying them.

In interpreting the implications of choice model results for real-world recreation sites, it is important to make a distinction between predictions of site choices and predictions of site use. Site choice refers to decisions made by individual people faced with a specific set of options. Site use refers to the number of people who actually arrive at a site. Site use is the aggregate outcome of many people's individual site choices, possibly modified by additional factors that can interfere with people carrying out their choices of which sites to visit. (For example, the number of people who choose to go to a site may exceed the maximum capacity for the site.)

To employ choice models such as these to forecast actual use levels at a site, a great deal of additional information would be needed beyond what is contained in the basic site choice model itself. At a minimum, we would need to know the locations and the site attributes of all the recreation sites in a region; and the locations and population sizes of all the population centers that make use of these sites. (The locations of population centers and recreation sites are needed in order to calculate travel distance, which is an important attribute in these site choice models.) We would also need information on people's level of awareness of available sites and their attributes. (A site cannot be in a person's choice set if they do not know it exists.) With all this information, theoretically, the site choice model could be applied to individuals at each population center, taking into account the different travel distances to sites from different origins. The results could then

be aggregated to predict how many people would visit each site. If there are segments of the population with significantly different site preferences and if the proportion of these segments in the population varies across population centers, then the model would have to be applied separately to the various segments and the results summed to predict total site use.

There are, however, still further complications in trying to link site choices with site use. Site use forecasts would have to take into account the effects that people's choices to visit sites have on site attributes such as crowding, noise, and the condition of facilities. These attributes are affected by use levels and in turn influence people's perceptions and further choices of sites. Thus the ultimate determination of site use levels would depend on dynamic feedback loops between people's choices and the attributes of sites. If sites become filled to capacity, additional modeling steps would be needed to determine how people respond when they arrive at their site of choice and are not able to gain access. (Do they go home, look for another nearby site, go to a motel?) To determine whether site capacities are being reached, we would need to know the number of people on site at any given time. This in turn depends on how visits are distributed over time and on how long people stay at the site. Thus, to obtain realistic predictions of site visits, site choice models would need to be incorporated into a larger and more complex geographic modeling framework to track interactions between use levels, site capacity, fees, and other park attributes in a region over time. To actually carry out such a regional park simulation would be an ambitious goal for future research.

There is an additional problem in trying to predict actual site use, having to do with how the "none of the above" option is handled in the choice survey. To predict numbers of visitors at a site, it is important to know not just the relative preference for choosing between alternative sites, but also how likely a person is to choose to go on a recreational outing, versus not going on such an outing at all. It is not immediately obvious how a generic alternative to a recreation trip ought to be described in a choice survey. In the Chicago model the alternative to visiting a park was described as going to some place other than a park for an outdoor activity. In the Lake States model the alternative to making a 2- to 3- night recreational trip was described as "stay at home". Neither of these wordings, however, includes all of the possible ways in which a person could spend their time if they chose not to visit any of the recreation sites in the hypothetical choice set presented to them.

In general, it is probably much easier for a survey respondent to make a preference comparison between two recreation sites than to make a comparison between going to a recreation site and the rather nebulous alternative of "doing something else". All of this means that choice models such as these are probably much better at predicting the likelihood of choosing one recreation site versus another site than at predicting the likelihood of making versus not making an outdoor recreation trip.

Despite these complications, it might be possible in some cases to use the predicted changes in site choice probabilities that were presented earlier in this paper to predict percent changes in a site's use. The mathematical properties of the logit transformation are such that percent reductions in choice probabilities resulting from a fee change at a site will translate into a corresponding reduction in predicted site use, provided that two assumptions are met. First, everyone who could visit the site in question must have a very attractive set of other options to choose from as well. Second, site attributes that influence people's choices must themselves not be altered as a result of changes in site use. This means, in particular, that there must be no effects due to crowding or capacity constraints at any of the available sites. As before, if there are segments of the population of park users who have different preferences for fees, then the percent change in site use would have to be determined separately for each segment and then summed to get the overall impact.

Clearly, there are ample opportunities for future research and development involving recreation site choice models and their application to real-world situations. As far as the issue of user fees is concerned, the next logical step for site choice models would be to develop models that focus more precisely on fees and how they are implemented. The models discussed in this paper included a broad range of site attributes in an effort to provide realistically detailed descriptions of parks. Fees were only one of many attributes of interest in these models, and the large number of attributes that respondents had to consider in making their choices may have somewhat obscured the influence of fees. Also, the ranges of fees in these models were limited to what seemed realistic for existing recreation sites at that time. This may have restricted the ability of the models to measure sensitivity to fees, particularly in the campground model. With the recent increased interest in charging higher fees at public sites, it would be appropriate to include a much wider range of fee levels in future choice models.

Models designed specifically to assess the impact of fees could present a smaller, more focused set of attributes and a more detailed range of fee levels. Such models could also present different alternatives for implementing fees—for example paying the fee on-site versus having to buy a permit at a sporting goods store ahead of time, paying to park one's car versus paying to enter the site itself, and so on. Stated choice models focused in this way on specific kinds of user fees and on different strategies for their implementation could be a valuable tool as recreation managers come to rely more and more on user fees to achieve their goals.

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