An Evaluation of the Importance of Site Characteristics on Freshwater-Based Recreations in the United States

Authors:

Ramesh Ghimire
University of Georgia
Warnell School of Forestry and Natural Resources
180 E. Green Street, Athens, GA 30602-2152, USA
Email: ghimire@uga.edu; Phone: +1 706 542 3098; Fax: +1 706 542 8356

Gary T. Green
University of Georgia
Warnell School of Forestry and Natural Resources
180 E. Green Street, Athens, GA 30602-2152, USA
Email: gtgreen@uga.edu; Phone: +1 706 542 6556; Fax: +1 706 542 8356

Krishna P. Paudel
Louisiana State University
Department of Agricultural Economics
225 Agricultural Administration Building, Baton Rouge, LA 70803-5604
Email: kpaudel1@lsu.edu; Phone +1 225 578 7363; Fax +1 225 578 2716

Neelam C. Poudyal
University of Tennessee
Department of Forestry, Wildlife and Fisheries
Knoxville, TN 37996, USA
Email: npoudyal@utk.edu; Phone: +1 706 974 8771

H. Ken Cordell
USDA Forest Service, Southern Research station
320 Green Street, Athens, GA 30602-2044, USA
Email: kcordell@fs.fed.us; Phone: +1 706 559 4263; Fax: +1 706 559 4245

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Abstract:

Amenities at recreation sites are important not only to maintain healthy life of recreation sites, but also to provide visitors greater inspiration to visit these sites. Hence, people place importance on site amenities, based on the activities they participated in. Using freshwater-based recreation data from a national survey and employing spectral analysis and rank ordered logit model, we found that closeness and size were the two most important qualities. Further, we found that recreationalist boaters were more likely to place importance on closeness; swimmers, recreationalist boaters, and picnickers were more likely to place importance on water-quality; and recreationalist fishermen and bird/nature viewers were more likely to place importance on wildlife, while participating in freshwater-based recreations. Freshwater recreation managers may benefit from the findings as our results offer guidance in understanding what kind of attributes to manage as well as improve to meet the needs of various types of user groups.

Keywords: Outdoor Recreation, Rank Ordered Logit Model, Site Characteristics, Spectral Analysis.

JEL Classification: Q26

1. Introduction

Visitors' decision to participate in a particular recreation activity or to visit a recreation site is affected by their taste as well as socioeconomic and demographic characteristics. Site-based amenities are equally important in their decision to select a recreation site or an activity (Paudel et al. 2011; Parsons et al. 1999; Dvarskas 2007; Hanley et al. 2003; Murray et al. 2001). Without a good understanding of the expectations and needs of their clients, recreation resource managers can struggle in prioritizing their management efforts. A variety of recreation activities are possible in some natural areas such as a forest or a lake, which makes it important for managers to understand the preference of heterogeneous users groups and manage the resources accordingly.

Extensive studies have analyzed the importance of coastal amenities from a beach visitation point of view (e.g., Beharry-Borg and Scarpa 2010; Cooper and Boyd 2011; Lilley et al. 2010; Murray et al. 2001). However, few studies have analyzed the role of site characteristics in the choice of outdoor recreation activities (e.g., Acharya et al. 2003; Cutter et al. 2007; Paudel et al. 2011). Additionally, limited studies have analyzed the rank or importance placed by visitors on site characteristics. Using data from the National Survey on Recreation and the Environment (NSRE) conducted on 2010, this study examined the importance of site characteristics, such as size (size, depth, and overall amount of water at the site), water quality (cleanliness of the water at the site), wildlife (amount of fish, birds or other wildlife at the site), and closeness (closeness of the site to your home) on freshwater-based recreations, such as fishing, boating, swimming, bird/nature viewing, and picnicking in the United States. Using spectral analysis and rank ordered logit model, this study found that recreationalist boaters are likely to place importance on closeness; swimmers, nature viewers, and picnickers were likely to place importance on water; and

recreationalist fishermen and bird/nature viewers were likely to place importance on wildlife compared to the base outcome – closeness.

A study analyzing the importance of site characteristics on freshwater-based recreational activities is policy relevant. Freshwater recreation is one of the major water-based recreation activities in the United States (Bowker et al. 2012) and these water-bodies are easily accessible to the general public. In addition, participation in water-based recreations, in general, has increased overtime and projected to continually increase in the future (Cordell et al. 2004). In this regard, management of these water bodies has huge potential to generate natural resource based revenues. Hence, improved knowledge of visitors' preference and factors influencing their participation are crucial for planning and policy formulation. Findings of this study could be useful for local governments to formulate policies to better utilize their natural resources, giving revenue benefits to the local government and health benefits to the general public.

2. Site Characteristics and Outdoor Leisure Activities

Amenities at recreation sites are important for maintaining the healthy life of recreation sites, and for also inspiring people to visit. In fact, studies have found that site amenities play an important role in helping to increase number of visitors and to multiply recreation activities. For instance, water quality at recreation sites (e.g., beach, lake, river) is important and a deteriorating water quality is likely to reduce the probability of visitors selecting that sites for recreational use (Dvarskas 2007; Hanley et al. 2003; Murray et al. 2001). Likewise, size of recreation sites (e.g., length or width of beach, lake, river) is important and likely to influence the probability of visitors selecting a particular recreation site (Lew and Larson 2005). Availability of fish, birds or other wildlife (e.g., deer, moose) at a site also directly affect the utility for visitors (e.g., hunters, bird/nature viewers) and, thus, increase the probability of visitors selecting that site for their

recreation use (Schwabe et al. 2001). Besides these physical characteristics, distance to the recreation site, a close proxy of travel time or travel costs is equally important on people's decision to choose a recreation site or activity (Walls, 2009). Hence, sites closer to domicile are more likely to be selected for recreation use compared to sites that are far away from a domicile (Dwyer et al. 2004).

However some outdoor recreation activities need a greater use of certain environmental amenities compared to others. For instance, water quality (cleanliness of the water at the site) could be more important for activities that need a direct contact with water, such as swimming, compared to bird/nature viewing. Hence swimmers are likely to place greater importance on water quality, compared to other site amenities (Dvarskas 2007; Hanley et al. 2003; Murray et al. 2001). Wildlife (amount of fish, birds or other wildlife at the site) could be important for recreational activities, such as fishing or bird/nature viewing, but it creates disutility for activities, like swimming or boating. Hence, fishers or bird/nature viewers are likely to place greater importance on wildlife, compared to swimmers or boaters.

Size (size, depth, and overall amount of water at the recreation site) matters for certain recreation activities. For instance, activities, such as boating and bird/nature viewing greatly depend on size. Hence people participating on boating or bird/nature viewing are likely to place greater importance on size. Closeness (closeness of the site to your home) could be important for many outdoor recreation activities, but it might be more important for activities that need to carry heavy recreational equipment, such as recreational boats. Hence recreationalist boaters are likely to place importance on closeness, compared to other site amenities.

The foregoing review shows that people participating in different recreation activities could have different priorities for site characteristics. Taking into account five freshwater-based

recreation activities – swimming, boating, fishing, bird/nature viewing, and picnicking across four different site characteristics - closeness, water quality, wildlife, and size, the unique contribution of this study aims to test these premises empirically.

While site characteristics are important for outdoor recreation activities, the outdoor recreation literature suggests socioeconomic and demographic characteristics are equally important in understanding people's participation in outdoor recreational activities. In fact, literature reveals that gender (Henderson 1991; Henderson and Bialeschki 1991; Scott and Jackson 1996), ethnicity (Floyd 1998; Floyd et al. 2006; Wilson 1980), age (Payne et al. 2002; Scott and Jackson 1996; Floyd et al. 2006), income (McCarville and Smale 1993; Scott and Munson 1994; Kelly 1996), and education (Alexandris and Carroll 1997; Kelly 1996) are important determinants of peoples' participation in outdoor recreational activities. Females may have different recreational preference than males because of their biological nature (Lee et al. 2001), leading to different importance being placed on site characteristics than their counterpart, males. For instance, females often encounter lack of time, face money or opportunities constraints, which leads to lack of participation, especially when their intend activities are far away from their domicile (Henderson and Allen 1991). This implication suggests that women are more likely to place greater importance on the closeness of desired activity. Studies also found that ethnic minorities participate in outdoor recreational activities at lower levels or engage in different form of recreational activities, leading to different preference on site characteristics (Floyd 1998; Floyd et al. 1994). Since ethnic minorities are somewhat more concerned with possible violence at recreation sites (Johnson et al. 2001), they may want to participate in outdoor recreational activities nearer to their domicile. This implication may also suggest that these minorities are likely to place greater importance on the closeness of their desired activity.

Individuals also pursue different recreation activities according to where they are in their lifespan (Levinson 1986). Older people tend to have different outdoor recreational preference and also participate less in outdoor activities because of financial and physical constraints and ageism than their counterpart, younger people (Floyd et al. 2006; Gross et al. 1978; Iso-Ahola et al. 1994). Hence, aging may lead to different importance being placed on site characteristics. For instance, older people may place greater importance on closeness as sites closer to their domicile are more economical to visit, compared to some other outdoor recreation activities, such as backcountry hunting. Conversely, younger people may place greater importance on wildlife as they are likely to enjoy wildlife related adventure and also likely to have skills and resources for these adventures.

As most recreational activities require financial and cultural resources, income and education are likely to affect peoples' participation (Gramann and Allison 1999; Kelly 1996; Lee et al. 2001; Clarke 1956). Further, people with different level of income or education may have different recreational preferences and, hence, priorities on site characteristics. For instance, people with higher income or education may place greater importance on environmental amenities (e.g., water quality or wildlife) because they are able to bear the marginal increase in cost associated with using better environmental amenities (Straughan and Roberts 1999; Zimmer et al. 1994).

People with kids could have fewer outdoor recreational opportunities because of greater family responsibility, and different activity preferences than their counter parts (Rapoport and Rapoport 1975; Torkildsen 1992). For instance, parents may want to participate in those activities where kids can be engaged easily. Likewise, parents may also want to choose recreation sites close to their domicile or safe from wild animals. To account for these effects, this study controlled for the total number of dependent less than 16 years as an additional covariate. People with greater participation in outdoor recreational activities may have different preference on site characteristics.

Studies show that greater participation in outdoor recreation activities helps to foster people's pro-environmentalism or their concern for environmental quality (Dunlap and Heffernan 1975; Thapa and Graefe 2003; Porter and Bright 2003). That is, people are likely to place greater importance on environmental amenities, for instance, water quality. To control for this effect, this study accounted for number of freshwater-based recreation trips made by respondents in a year as an additional covariate. Finally, because of variations in climate, topography, culture, and recreational resources across the United States, people in different geographic regions may have different preferences on site characteristics. To account for this effect, geographic regions were also controlled for using region specific dummies.

3. Methods

This study used spectral analysis to find the most preferred site characteristics on freshwater based recreation activities as ranked by the respondents. A spectral analysis is similar to the classical two-way ANOVA and ANOVA is a special case of spectral analysis (Diaconis 1988, ch.8, p. 153). However, there is an important difference between the two – while generalize spectral analysis consider order of preference or ranking, ANOVA does not consider it (Diaconis 1989). Spectral analysis captures the natural symmetries present in the data that are generally hidden in the existence of a symmetric group (Pedrotti et al. 2006). Generalized spectral analysis is used to decompose data and this decomposition allows for underline two effects: the first and second order effects. While the first order effect measures the average attraction that a single feature has when it is coupled with a second one, the second order effect detects the positive (or negative) power of combination of two coupled attributes (Pedrotti et al. 2006). Since spectral components group pair of control options and identify the corresponding pairs to find the

preference, one must use a spectral decomposition method compared to ANOVA to find the most preferred site characteristics (Paudel et al. 2013).

Let's assume there are *n* site characteristics (options) available to the respondents for ranking denoted by *i*, *i* = 1, 2, …,*n*. Let $\pi(i)$ denotes the rank given to *i* th site characteristics. This type of data can be represented using permutation. A permutation π is a bijective function $\pi:(1,2,...,n)\rightarrow(1,2,...,n)$ associated with each item $i \in (1, 2,..,n)$ (Critchlow 1985). Hence, the number of $\pi:(1,2,...,n)\rightarrow(1,2,...,n)$ respondents choosing raking preference π forms a dataset which is denoted by f (π) and can be expressed as

$$f(\pi)=\begin{pmatrix} 1 & 2\ldots\ldots..n \\ \pi(1) & \pi(2)....\pi(n) \end{pmatrix}. \quad (1)$$

If *n* items are ranking, the permutation of the number of items multiplied by their frequencies provides the sample size of the data for complete ranking. Since four options were provided to the respondents to rank from the most preferred to the least preferred, there will be 4! (=24) complete ranking combinations. Table 1 showed the possible ranking patterns and the number of respondents choosing these ranking patterns.

4. Data

This study used outdoor recreation participation data from the National Survey on Recreation and the Environment (NSRE). The NSRE is a series of random-digit-dialed telephone surveys of approximately 5,000 people, living in U.S. households. The NSRE represents only

civilian, non-institutionalized Americans, 16 years of age or older.[1] The NSRE telephone survey employed a stratified random sample, based upon urban/rural/near-urban geographic locations.[2]

While the NSRE is a long term data collection project, data required for this study was collected in 2010. The survey was conducted using a computer-aided telephone interviewing system (CATI). The CATI system randomly selects a telephone number, the interviewer upon hearing someone answer, inquires how many people in the household are 16 years or older. The person with the most recent birthday is selected for interviewing (Link and Oldendick 1998; Oldendick et al. 1988). This particular NSRE survey consisted of three modules or sets of questions related to outdoor recreation participation, freshwater recreation module, and kids module. Besides, the NSRE collected socioeconomic and demographic characteristics of the respondents (Cordell et al. 1999; Cordell et al. 2004).

In the freshwater recreation module, people who indicated they participated in any freshwater-based recreation activities (single day trip) during the past 12 months were asked to rank the importance of four site characteristics: closeness (closeness of the site to your home), size (size, depth, and overall amount of water at the site), water quality (cleanliness of the water at the site), and wildlife (amount of fish, birds, or other wildlife at the site) in their decision to participate in freshwater-based recreation activities, such as swimming, fishing, boating, nature viewing, and picnicking. In the survey, a total of 780 people indicated they participated in any freshwater

[1] Non-institutionalized refers to people who are not in retirement facilities, hospitals, and military forces.
[2] Each version consisted of modules of questions and each version was tested to ensure an average time of 15 minutes to complete. Approximately 5,000 people were surveyed in each version. Some over-sampling was done to ensure a minimum sample size of 500 per state (across all versions) or for some modules that focus on rural outdoor recreation use i.e., over-sampling of people living in rural areas. U.S. Department of Commerce, Bureau of the Census, and the 2000 Census data were used to construct post-sample weights to correct for over-sampling. Both English and Spanish versions of the questionnaires were used and interviews were conducted bilingually to overcome language barriers.

recreation activities (single day trip) during the past 12 months and, thus, ranked these site characteristics in a scale from one – most important to four – least important at all.

Table 2 provided summary statistics of the variables used in this analysis. The variable rank was rank or importance placed by respondents on the four site characteristics – closeness, water-quality, size, and wildlife from most important to least important in their selection of freshwater-based recreations (Table 3). The variables gender, ethnicity, geographic regions, education, and freshwater recreation activities (swimming, boating, fishing, nature viewing, and picnicking) were all binary. The income variable was measured using a scale of 1-11, with higher values denoting higher levels. The variables age, number of trips (total freshwater-based recreational trips made over the last 12 months), and number of dependents under 16 years were all continuous.

5. Results from Spectral Analysis

Since four options were provided to the respondents to rank (closeness, size, water quality, and wildlife) from most preferred to the least preferred, this gave a total of 4! (=24) complete ranking, as shown in Table 4. Table 4 shows the percentage of respondents ranking preference *i* in position *j*. The table indicated that 40.4% of respondents preferred closeness as their first choice for freshwater-based recreation activities and 34.5% respondent favored water quality as their second choice. Likewise, 28.5% respondents indicated wildlife as their third choice and 55% respondents preferred size as their fourth choice. The result of first order spectral analysis was shown in Table 5. The largest number 123 in the first column indicated that closeness received the most votes as respondents' first most important site characteristics. The largest number in the second column, 76, showed that water quality received the most votes as the second most important site characteristics. Wildlife and size options were the third and fourth choice of respondents.

Table 6 shows result of the second order analysis. The second order analysis identified six distinct combinations of the site characteristics that the respondents can rank. Geometrically, the function projected to 36 points in a four-dimensional space. That is, there were only four independent values in the table consisting of 36 values (Paudel et al. 2013). Because of four-dimensions in second order decomposition, there were some values equal as shown in Table 6. The largest value 25.17 in the first column indicated that there was a substantial effect between treatment options closeness and size in ranking (1,2). For pairs of treatments like closeness and wildlife, there was an opposite effect: every visitor liked both or disliked both treatment options because the row entry begins and ends (-,-) with the same value. Based on the highest value of closeness treatment option and size treatment option in the second ordered effect and the highest value of closeness treatment option in first ordered effect, it can be inferred that these two were the two most desirable treatment options chosen by the visitors.

The foregoing analysis showed that visitors preferred closeness based on the first order analysis. Results also indicated that the two most preferred site based amenities were closeness and size. However, results did not reveal how different respondents' characteristics affect their choice patterns. Hence, there was a need to examine visitor's preference issue using rank ordered logit model.

6. Rank Ordered Logit Model

When individuals are asked to rank the alternatives (under the assumption of complete ranking) instead of only choosing the most preferred option, the parameters of the choice model, and, hence the preferences can be estimated more efficiently using the rank ordered logit model, developed by Beggs et al. (1981). The rank ordered logit model is similar to multinomial logit model in-terms of mathematical description and numerical computations. However, there is

important difference between the two; while the dependent variable in the rank-ordered logit model is ordinal, showing preferences among alternatives; it is binary in the multinomial logit model, indicating a chosen alternative. Moreover, since individuals rank alternatives in order, such as ranking the most preferred first, the second most preferred second and so on, the use of complete ranking (rank ordered model) results into efficiency gain relative to standard multinomial logit model (van Dijk et al. 2007).

The basic analytical framework for the rank ordered logit model came from the random utility model (van Dijk et al. 2007). The random utilities for individual i are a set of latent variables $U_{i1},.....,U_{iJ}$, defined as

$$U_{ij} = V_{ij} + \varepsilon_{ij}, \tag{1}$$

where $i = 1,....,N$ indexes individuals and $j = 1,....,J$ indexes items. Equation (1) consists of two parts: V_{ij} is the deterministic component of the utility and ε_{ij} is the random component that represents the researcher's ignorance about the consumer utility function. The deterministic part of the utility is modeled as

$$V_{ij} = x_i'\beta_j, \tag{2}$$

where x_i is an *m*-dimensional vector with characteristics of individual i and β_j is an *m*-dimensional parameter vector specific to alternative j (van Dijk et al. 2007). Let us denote the response of respondent i by the vector $y_i = (y_{i1},....,y_{iJ})'$, where y_{ij} denotes the rank that individual i gives to item j. For example, if $y_{ij} = 1$ this means that the respondent considers alternative j the first most preferred option. For notational convenience let us use the equivalent

notation $r_i = (r_{i1}, ..., r_{iJ})'$, where r_{ij} denotes the item number that received rank j by individuals i. The relation between r_i and y_i is given by

$$y_{ik} = j \Leftrightarrow r_{ij} = k \tag{3}$$

for $j, k = 1, ..., J.$

Individual prefers an item with a higher utility over an item with a lower utility. If we observe a full ranking r_i, we know that

$$U_{ir_{i1}} > U_{ir_{i2}} > ..... > U_{ir_{iJ}}. \tag{4}$$

Under the utility assumption (1) and the assumption of the extreme value distribution of the random component (ε) in equation (1), we obtain the rank-ordered logit model, with the probability of observing a particular ranking r_i equals

$$\Pr[r_i; \beta] = \Pr[U_{ir_{i1}} > U_{ir_{i2}} > .... > U_{ir_{iJ}}]$$

$$= \prod_{j=1}^{J-1} \frac{\exp(V_{ir_{ij}})}{\sum_{l=j}^{J} \exp(V_{ir_{il}})}. \tag{5}$$

The log likelihood function for the rank ordered logit model is then given by

$$\ln L = \sum_{i=1}^{n} \sum_{j=1}^{J} d_{ij} \ln \frac{\exp(V_{ir_{ij}})}{\sum_{l=j}^{J} \exp(V_{ir_{il}})}. \tag{6}$$

To obtain the empirical model, the component in the vector x_i of $V_{ij} = x_i \beta_j$ was specified as a function of freshwater based recreation activities (swimming, boating, fishing, bird/nature viewing, and picnicking) and controlled for socioeconomic and demographic characteristics of the respondents as suggested in outdoor recreation literature.

7. Results from Rank Ordered Logit Model

Table 7 summarizes results from the rank ordered logit estimates and shows that visitors placed importance on site characteristics, based on the recreational activities they participated in.[3] People participating in boating were likely to place importance on closeness. Conversely, people who participated in fishing, bird/nature viewing, and picnicking were less likely to place importance on closeness. People who participated in swimming were less likely to place importance on closeness, but the results were statistically weak. Regarding water quality, people who participated in swimming, boating, and picnicking were more likely to place importance on water quality. Bird/nature viewers were also more likely to place importance on water quality and fishers were less likely to place importance on water quality, but the results were statistically insignificant. Results indicated that people who participated in fishing and nature viewing were more likely to place importance on wildlife. Likewise, people who participated in picnicking were more likely to place importance on wildlife, but the results were insignificant. Conversely, people who participated in boating were less likely to place importance on wildlife. Likewise, people participated in swimming were also less likely to place importance on wildlife, but the results were statistically weak.

Regarding controls, the variables nonwhite and members under 16 years were statistically significant in the closeness equation (column 1). In the water quality equation (column 2), trip size was positively significant, implying that more frequent visitors were more likely to place importance on water quality. Geographic region dummies for South and West were negatively significant, implying that Southerners and Westerners were less likely to place importance on water quality, compared to Westerners. Finally, in the wildlife equation (column 3), age, gender,

[3] To ease interpretation of the regression results, order of the ranking was reversed, with 1 denoting least important and

income, income squared, education, education squared, and West were all statistically significant to explain the probability that wildlife gets importance in course of selecting recreation sites.

8. Discussions

Using the spectral analysis and rank ordered logit model, this study revealed that people placed importance on site characteristics, based on activities they participated in. For instance, boaters viewed closeness as an important site characteristic. Since recreationalist boaters need to carry boats and equipment, recreation sites close to their domicile are more economical for them to visit and hence it makes sense to see importance placed by recreationalist boaters on closeness. Conversely, people who participated in fishing, bird/nature viewing, and picnicking were unlikely to place importance on closeness. More than 77 percent of respondent in the sample were from urban areas where fishing and bird/nature viewing opportunities may not be readily available. Hence these respondents might have to go far away from their home to get engaged in these activities and were subsequently less likely to place importance on closeness in their recreation site selection.

Since recreational activities, such as swimming and boating need a direct contact with water, it makes sense to see importance placed on water quality by people participated in swimming and boating. This finding is also consistent with previous research that states water quality is an important factor in beach selection (Dvarskas 2007; Hanley et al. 2003; Murray et al. 2001). People who participated in picnicking were likely to place importance on water quality. Since people who participated in picnicking were more likely to participate in swimming or boating, with 78 percent people participating in swimming and 76 percent participating in boating

4 denoting most important.

in our sample, this result makes intuitive sense as water quality is an important site characteristic for these participants.

Utility of recreationalist fishermen depend on the amount of fish and utility of bird/nature viewers depend on the amount of fish, bird, and other wild animals at the site. Consistent with this logic, this study found recreationist fishermen and bird/nature viewers were likely to place importance on wildlife. Conversely, the presence of crocodiles, sharks, or other large fishes sometimes creates disutility for swimmers. As per this logic, this study found that swimmers were unlikely to place importance on wildlife.

Nonwhites were more likely to place importance on closeness in their site selection, compared to whites. Previous studies found that marginalized groups in the United States were unlikely to participate in outdoor recreation activities because of fear of being attacked at recreation sites (Johnson 1998; Virden and Walker 1999). If this is the case, marginalized groups are more likely to place importance on closeness in their site selection. Closeness may be important for many people, but it might be more important for people with kids because of their limited time and various responsibilities in their household. Hence it makes sense for importance to be placed on closeness by people with kids. Previous studies found that greater participation in outdoor recreation activities often fosters people's pro-environmentalism or greater awareness of environmental issues (Dunlap and Heffernan 1975; Thapa and Graefe 2003; Porter and Bright 2003). Consistent with these findings, this study revealed that people with greater outdoor recreation participation, measured by number of freshwater-based recreation trips, were more likely to place importance on water quality. Regarding geographic regions, Southerners and Westerners were unlikely to place importance on water quality. This may be because water quality is not an issue on outdoor recreation activities in the West and the South, compared to the East.

Age was negatively significant in the wildlife equation (column 3), implying that older people were less likely to place importance on wildlife. This results may be because of increasing fear from wild animals among older people (Røskaft et al. 2003). In addition, older people often express negative attitude towards wild animals relative to younger people (Bjerke et al. 1998a; Bjerke et al. 1998b; Kellert 1987, 1991). Males were more likely to place importance on wildlife than females. This finding may be because of the different sex-roles in our evolutionary past; women being more attached to the vicinity of the camps, while men were hunters, and the fact that the consequences of a wild animal attack on women are more likely to be fatal (Røskaft et al. 2003). Further, women often have more negative attitudes towards wild animals than men, making them unlikely to place importance on wildlife (Røskaft et al. 2003; Costello 1982; Öhman 1986).

People with higher income were more likely to place importance on wildlife, although the relationship was non-linear: as income increases, the probability of placing importance on wildlife increases, but at a decreasing rate. Previous studies found that wildlife viewing was popular among people with higher income (Meric and Hunt 1998). So it makes sense for a positive relationship to exist between income and the probability that wildlife gets importance on recreation site selection. However, level of education was negatively associated with the probability of placing importance on wildlife and this relationship was non-linear as well. Although education often greatly reduces fear of wild animals (Røskaft et al. 2003), the observed negative relationship between education and wildlife may be due to the urban origin of these educated people. Previous studies found that people with urban origins are less likely to place importance on wildlife (Heberlein and Ericsson 2005). In this study, 61 percent of respondents, with at least college degree, were from urban areas, hence the urban origins might have outweighed the effects of education on valuing wildlife. Since kids are far more vulnerable to wild animals' attack than adults (Beier 1991; Linnell et al.

2002), it is natural to see that people with kids (under 16 years) were unlikely to place importance on wildlife. Finally, Westerners are more likely to place greater importance on wildlife because of greater availability of and familiarity with outdoor recreation resources in general and popularity of wildlife related adventures in particular in the Western region compared to the Northeast region.

9. Conclusion

In place of traditional multinomial or ordinal models, this study used rank ordered model to estimate the importance of site characteristics on freshwater-based recreations. The findings revealed that site characteristics were important for freshwater-based recreations and people placed importance on these site characteristics, based on activities they had participated in. Overall speaking, spectral analysis identified that closeness and size were the first and second most preferred site characteristics. Closeness could be important for many activities, but this study found that it was important for boating and hence recreationalist boaters are more likely to place importance on closeness. However, people who participated in fishing, bird/nature viewing, and picnicking were less likely to place importance on closeness. Water quality was important for swimming, boating, and picnicking and people who participated in these activities were more likely to place importance on water quality. Wildlife was important for fishing and bird/nature viewing and people who participated in these activities were more likely to place importance on wildlife.

Findings of this study offer meaningful guidance for freshwater resource managers in understanding the expectation and preference of their clienteles and accordingly mange the water resources to meet the needs of variety of user groups. As per visitors' preference, water-based recreation areas could be managed accordingly, such as designating bigger lakes for boaters use, investing limited dollars to keep smaller water bodies clean enough to benefit swimmers and

picnickers. As certain recreationists place higher preference on certain attributes, they may also be willing to pay a premium to use sites of desired characteristics, and that could provide an opportunity for managers to collect additional revenue in user fee. Future studies could use contingent valuation survey to estimate such premium associated with the site attributes so that a reasonable market protocol could be established to assist manager with pricing policy.

Table 1: Preference on Site Characteristics in Freshwater-based Recreation al Activities, Complete Ranking

Combination	Ranking (π)				Respondents	
	First	Second	Third	Fourth	Frequency	Percent
1	1	2	3	4	33	4.11
2	1	2	4	3	16	1.99
3	1	3	2	4	69	8.59
4	1	3	4	2	108	13.45
5	1	4	2	3	34	4.23
6	1	4	3	2	64	7.97
7	2	1	3	4	11	1.37
8	2	1	4	3	5	0.62
9	2	3	1	4	8	1
10	2	3	4	1	10	1.25
11	2	4	1	3	1	0.12
12	2	4	3	1	6	0.75
13	3	1	2	4	41	5.11
14	3	1	4	2	74	9.22
15	3	2	1	4	18	2.24
16	3	2	4	1	16	1.99
17	3	4	1	2	72	8.97
18	3	4	2	1	29	3.61
19	4	1	2	3	14	1.74
20	4	1	3	2	73	9.09
21	4	2	1	3	5	0.62
22	4	2	3	1	14	1.74
23	4	3	1	2	50	6.23
24	4	3	2	1	32	3.99
Total					803	100

Note: 1- closeness, 2 – size, 3 – water quality, and 4 – wildlife

Table 2: Summary Statistics of Variables

Variable	Mean	Std. Dev.	Min	Max
Rank (importance placed on site characteristics)	2.5	1.11	1	4
Age	48.58	14.64	16	90
Gender, 1=female, 0=male	0.45	0.49	0	1
Income (in a scale from one to 11)	7.98	2.19	1	11
Education, 1=college completed, 0=college not completed	0.57	0.49	0	1
Ethnicity, 1=nonwhite, 0 =white	0.09	0.27	0	1
Number of trips in a year	4.02	6.02	0	100
Number of members under 16 years in household	0.89	1.18	0	6
Freshwater-based activities, swimming =1	0.65	0.47	0	1
Freshwater-based activities, boating =1	0.63	0.48	0	1
Freshwater-based activities, fishing=1	0.58	0.49	0	1
Freshwater-based activities, nature viewing=1	0.57	0.49	0	1
Freshwater-based activities, picnicking =1	0.74	0.44	0	1
Geographic region, Midwest =1	0.14	0.33	0	1
Geographic region, South =1	0.32	0.46	0	1
Geographic region, West =1	0.32	0.46	0	1
Geographic region, Northeast =1	0.16	0.36	0	1

Table 3: Importance Rating on Site Characteristics for Freshwater-based Recreation al Activities

Site characteristics	Mean	Std. Dev.	Min	Max
Closeness	2.05	1.06	1	4
Water quality	2.12	0.95	1	4
Wildlife	2.50	1.08	1	4
Size	3.32	0.88	1	4

Note: 1 – most important and 4 – not important at all in their decisions to participation in freshwater based recreation activities

Definition of the site characteristics

Closeness – closeness of the site to your home
Water quality – cleanness of the water at the site
Size – size, depth, and overall amount of water at the site
Wildlife – amount of fish, birds, or other wildlife at the site

Table 4: Percentage of Respondents Ranking Site Characteristics *i* in Position *j*

	Rank			
Site characteristics	1	2	3	4
Closeness	40.4	27.2	19.2	13.3
Size	5.2	12.7	27.2	55
Water quality	31.2	34.5	25.1	9.4
Wildlife	23.2	25.6	28.5	22.4

Table 5: First Order Effects – Complete Ranking

	Rank			
Site characteristics	1	2	3	4
Closeness	123	17	-47	-94
Size	-158	-99	18	240
Water quality	49	76	0	-126
Wildlife	-13	5	28	-21

Table 6: Second Order, Unordered Effects

	Rank					
Site characteristics	1,2	1,3	1,4	2,3	2,4	3,4
Water quality, closeness	-9.83	10.67	-0.83	-0.83	10.67	-9.83
Water quality, wildlife	25.17	-9.83	-15.33	-15.33	-9.83	25.17
Water quality, size	-15.33	-0.83	16.17	16.17	-0.83	-15.33
Closeness, wildlife	-15.33	-0.83	16.17	16.17	-0.83	-15.33
Closeness, size	25.17	-9.83	-15.33	-15.33	-9.83	25.17
Wildlife, size	-9.83	10.67	-0.83	-0.83	10.67	-9.83

Table 7: Site Characteristics and Freshwater-based Recreational Activities (Base Outcome – Size)

VARIABLES	Closeness (1)	Water quality (2)	Wildlife (3)
Age	-0.001	0.001	-0.010***
	(0.005)	(0.003)	(0.003)
Gender, male=1	0.025	-0.061	0.175*
	(0.130)	(0.090)	(0.097)
Income	-0.009	-0.093	0.287***
	(0.148)	(0.091)	(0.107)
Income squared	0.008	0.005	-0.024***
	(0.010)	(0.006)	(0.007)
Education	0.186	-0.058	-0.276*
	(0.210)	(0.151)	(0.167)
Education squared	-0.014	-0.001	0.024*
	(0.019)	(0.014)	(0.015)
Ethnicity, nonwhite=1	0.449**	-0.088	0.009
	(0.212)	(0.171)	(0.180)
Number of freshwater-based recreational trip	0.006	0.024***	-0.005
	(0.008)	(0.007)	(0.008)
Members under 16 years	0.091*	0.006	-0.180***
	(0.055)	(0.041)	(0.046)
Freshwater-based recreation, swimming=1	-0.202	0.263***	-0.006
	(0.138)	(0.101)	(0.108)
Freshwater-based recreation, boating=1	0.281*	0.175*	-0.224**
	(0.144)	(0.101)	(0.110)
Freshwater-based recreation, fishing=1	-0.538***	-0.077	0.537***
	(0.130)	(0.095)	(0.101)
Freshwater-based recreation, bird/nature viewing=1	-0.375***	0.087	0.454***
	(0.127)	(0.090)	(0.096)
Freshwater-based recreation, picnicking =1	-0.319**	0.195*	0.121
	(0.138)	(0.101)	(0.109)
Geographic region, Midwest=1	0.006	-0.172	0.250
	(0.203)	(0.149)	(0.160)
Geographic region, South=1	-0.022	-0.292**	0.059
	(0.160)	(0.116)	(0.129)
Geographic region, West =1	-0.265	-0.330***	0.269**
	(0.167)	(0.118)	(0.126)
Observations	653	653	653

Note: Rank ordered logit estimates. Dependent variable – rank placed on site characteristics – closeness, size, water quality, and wildlife in a scale from one to four, with one least important and four most important on different freshwater-based recreation activities. Standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

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