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Environmental Knowledge, Concern, Behavior & Education

AN EVALUATION OF APPALACHIAN TRAIL HIKERS' KNOWLEDGE OF MINIMUM IMPACT SKILLS AND PRACTICES

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Abstract: As the number of visitors to national parks and related areas continues to rise and the types of visitors and activities continue to diversify, educating visitors in minimum skills can help to protect parks and related areas. Educating visitors in these skills can be a challenge, especially on the Appalachian Trail (AT) that travels through state, federal, municipal and private lands. This paper examines overall minimum impact knowledge of AT hikers. Study findings will help managers to understand how much visitors know about minimum impact skills and how they can be most effective in educating hikers about minimum impact skills. Study data are drawn from a survey of nearly 2000 AT hikers in the summer and fall of 1999.

Introduction

As the number of visitors to parks and related areas continues to rise, there is increasing concern over the resource and social impacts of outdoor recreation. Research suggests that recreation visitors can significantly impact park resources through compaction and erosion of soils, trampling of vegetation, disturbance of wildlife, and pollution of streams and lakes (Hammitt & Cole, 1998). Moreover, increasing recreation use can also degrade the quality of the recreation experience through crowding and conflicting uses and through aesthetic consequences of the resource impacts noted above (Manning, 1999). Recreation managers are challenged to minimize the resource and social impacts of increasing recreation use.

The outdoor recreation literature suggests that there are a number of practices that might be used to help manage the impacts of recreation use. A conventional system of classifying recreation management practices defines such practices as direct and indirect (Gilbert et al., 1972; Peterson & Lime, 1979). Direct management practices regulate visitor behavior. As such, they limit visitors' freedom of choice in order to accomplish a desired management objective. For example, designated campsites require visitors to camp at specified locations to limit the ecological impacts associated with camping. Indirect management practices attempt to influence visitor behavior without regulating it. As such, they attempt to maintain as much visitor freedom as possible. For example, information can used to educate visitors about how to minimize the impacts of camping.

Both direct and indirect management practices have potential advantages and disadvantages. However, indirect management practices are generally preferred when they can be shown to be effective (Roggenbuck, 1992). From a theoretical standpoint, indirect management practices can be effective in addressing impacts resulting from several types of visitor behavior, including uninformed actions, careless or thoughtless behavior, and unskilled actions (Hendee, 1990). But how effective are visitor information and education programs? More specifically, how knowledgeable are visitors regarding minimum impact skills and practices? This study sought to answer this and related questions as they apply to the hikers on the Appalachian Trail.

Several studies have addressed this issue in a variety of park and related areas (Fazio, 1979; Feldman, 1978; Kernan & Drogan, 1995; Cole et al., 1997; Dowell & McCool, 1986; Jones & McAvoy, 1988; Sieg et al., 1988; Roggenbuck et al., 1992; Echelberger et al., 1978; Burde et al., 1988; Dwyer et al., 1989; Manfredo & Bright, 1991; Stewart et al., 2000; Harding et al., 2000; Cole, 1998; Christensen & Cole, 2000). For example, in a survey of visitors to the Allegheny National Forest, respondents received an average score of 48% on a 12-item true-false minimum impact quiz (Confer et al., 2000). Visitors to the Selway Bitterroot National Forest received an average score of 33% on similar quiz. However, the quizzes developed for these studies did not contain the same items nor did they use the same format.

Study Methods

Study Area

The Appalachian National Scenic Trail (AT) is a unit of the national park system. Established as the first National Scenic Trail by Congress with passage of the National Trails System Act in 1968, the AT is a continuous marked footpath extending approximately 2,160 miles across the Appalachian Mountains from the summit of Springer Mountain in Georgia to the summit of Mount Katahdin in Maine. The AT forms a greenway that connects public land areas in 14 states. These public lands include 8 national forests, 6 units of the national park system, and more than 60 state parks, forests and wildlife areas. The length and complexity of the AT suggest that visitor information and education programs are challenging.

Visitor Survey

The primary study method consisted of a survey of a representative sample of hikers along the AT. The survey addressed a wide-ranging set of issues, but for the purposes of this paper we are interested in matters regarding visitor

knowledge of minimum impact skills and practices. Several study questions were designed to address this and related issues. First, a 10-item "true or false" quiz was designed to test visitor knowledge of minimum impact skills and practices. Items included in this quiz were based on the Leave No Trace program, a formal organization and effort designed to educate outdoor recreation visitors in minimum impact skills and practices. These items were quite similar to the items used in Confer et al. (2000) described earlier. Second, respondents were asked the minimum distance that 1) human wastes should be disposed of from a stream or water source, and 2) campsites should be located from an established trail. Third, respondents were asked where they would seek information on minimum impact skills and practices. Finally, a number of visitor characteristics were measured to assess knowledge levels of selected types of visitors.

A detailed sampling plan was designed based on geographic divisions of the trail. For purposes of management, the AT is divided into four geographic regions – New England, Mid-Atlantic, Southwest Virginia, and the Deep South. To facilitate a more detailed sampling plan, the trail was further divided into twenty-two relatively homogeneous geographic segments based on physical features, park and wilderness boundaries, and volunteer hiking club jurisdictions. The regional divisions used in the sampling plan are shown in Table 1.

Table 1. Geographic/Administrative Divisions of the Appalachian Trail Study

New England	Mid- Atlantic	Southwest VA	Deep South
1. Baxter St. Park	10. New York	15. Blue Ridge Parkway	19. North of Smokies-Pisgah / Cherokee NF
2. 100 Mile Wilderness	11. New Jersey	16. Outing Club of VA Tech	20. Smoky Mtns.
3. Western Maine	12. Pennsylvania	17. Catawba	21. NC-Nantahala NF
4. NH-Mahoosucs	13. Maryland	18. Mount Rogers	22. Georgia
5. NH-White Mtns.	14. Shenandoah		
6. NH-South			
7. Vermont			
8. Massachusetts			
9. Connecticut			

Sampling was conducted by a combination of employees, volunteers of local trail-maintaining clubs and the ATC, and staff hired specifically for this study. Sampling consisted of approaching randomly selected AT visitors, briefly explaining the study, and asking if visitors would be willing to participate in the study by providing their name and address and completing a mail-back questionnaire at the completion of their visit. Sampling was designed to yield approximately 100 completed questionnaires for each of the twenty-two trail segments. In addition, thru hikers (visitors hiking the entire trail in one calendar year) were purposively sampled in Baxter State Park, Maine to insure that a large enough sample of this type of hiker was obtained for analysis purposes. The sampling plan was implemented in the summer and fall of 1999. A total of 2,847 AT visitors agreed to participate in the study and were mailed a questionnaire, cover letter, and postage-paid, self-addressed return envelope shortly after their visit. One week after the initial mailing, visitors were mailed a postcard thanking them for their participation and reminding them to complete and return the questionnaire. Visitors who did not return a completed questionnaire within three weeks of the initial mailing were mailed a second questionnaire, cover letter, and postage-paid, self-addressed return envelope. Finally, at the completion of the sampling period, all non-respondents were mailed a final copy of the questionnaire, cover letter, and postage-paid, self-addressed return envelope.

This sampling procedure yielded 1,879 completed questionnaires representing a 66 percent response rate. The majority of completed questionnaires (84 percent) were obtained from summer visitors, while the remaining questionnaires (16 percent) were obtained from fall visitors.

Study Findings

Knowledge of Minimum Impact Skills and Practices

Study findings for the 10-item quiz of minimum impact skills and practices are shown in Table 2. Correct answers were coded as a 10 and incorrect answers were coded as a 0, and overall mean scores are reported on a percentage basis that ranges from a possible high of 100% to a possible low of 0%. The overall mean score of all AT hikers was 82%. This varied from a high of 86% for thru-hikers to a low of 78% for day hikers.

Scores varied substantially on individual items. Over 90% of respondents knew that 1) use should be concentrated in obviously impacted areas, 2) all terrain vehicles are not allowed on the AT, 3) mountain bikes are not allowed on the AT, 4) it is best to travel on existing trails and walk singe file, and 5) hikers should not collect plants and rocks along the AT. Between 73% and 83% of respondents knew that 1) the same rules do not apply to the entire AT, 2) when encountering a horse party, you should wait until the horses have come to stop and then move quickly past them, and 3) building temporary fire rings by moving rocks and logs at your campsite in not an accepted low impact behavior. Only 66% of respondents knew that one should not camp next to a stream. And only 48% of respondents knew that when hiking in a lightly used location, it is best to camp on a site with no evidence of previous use.

Table 2. Percentage of Visitors Who Answered Questions Correctly

Minimum Impact quiz questions and answers			Day Hikers	Overnight Hikers	Section Hikers	Thru Hikers	All Hikers
True	**False**	When selecting a campsite in obviously impacted areas you should spread activities to places that have not been disturbed.	91	90	87	90	90
True	**False**	The same rules and regulations apply to the entire Appalachian Trail.	67	71	75	87	73
True	**False**	When hiking and encountering a horse party you should wait until the horses have come to a stop and then move quickly past them.	69	76	73	74	73
True	False	I cannot ride my mountain bike on the Appalachian Trail, because it is not allowed.	86	87	95	97	90
True	False	While backpacking, you should never camp next to a stream.	64	73	64	60	66
True	**False**	If I wanted to ride my All Terrain Vehicle on the A.T. I could do so as long as I stay on the trail.	100	99	100	99	100
True	False	When hiking in remote, lightly used locations it is best to camp on a site with no evidence of previous use to minimize your impact on the wilderness environment.	37	47	49	73	48
True	**False**	Building temporary fire rings by moving rocks and logs at your campsite is an accepted low-impact behavior.	73	87	90	92	83
True	False	When traveling on existing trails it is best to walk single file and stay on the main path to minimize impact.	99	99	99	99	99
True	False	Hikers should not collect plants and rocks along the Appalachian Trail.	97	98	99	97	97
Mean			**78**	**83**	**83**	**86**	**82**

Respondent scores on the minimum distances questions also varied (Table 3). Knowledge was quite high (mean score of 87%) on the question concerning the minimum distance that human wastes should be disposed of from streams and water sources. However, knowledge was considerably lower (mean score of 63%) on the question concerning the minimum distance campsites should be located from established trails.

Table 3. Overall Percentage of Visitors Who Answered Distance Questions Correctly

Correct Answer	According to accepted minimum impact practices for the AT:	% Reporting > 100 feet				
		Day Hikers	Overnight Hikers	Section Hikers	Thru Hikers	All Hikers
>100 feet	a. How far from a stream or water source (in feet) should you dispose of human wastes?	76	91	92	97	87
>100 feet	b. How far from an established trail (in feet) should you camp?	49	69	71	74	63

Sources of Minimum Impact Information

The survey also asked visitors where they would seek information on minimum impact or LNT skills and practices. Findings from this question might help managers more effectively disseminate information on minimum impact skills and practices to AT hikers. Findings are shown in Table 4. Books and magazines (43%), trail clubs/organizations (23%), and visitor centers/ranger stations (22%) were the most frequently reported sources. Rangers/volunteers (16%) and the internet (15%) constituted a second tier of sources.

Table 4. Percentage of Visitors Who Reported That They Would Obtain Information on Low-impact Backpacking from the Sources Listed

Information Source	% of hikers who would obtain information from source
Sporting Goods Stores	7
Newspapers	2
Books and Magazines	43
Brochures	12
Trailhead and Signs	9
Ranger or Volunteer	16
Visitor Center/ Ranger Station	22
The Internet	15
Audio or Video	1
Trail Clubs/ Organizations	23

Certain information sources were more popular for some groups than others. For example, day and overnight hikers reported that they would seek information on minimum impact skills and practices from books and magazines more often than would section and thru hikers.

Who Are the Most Knowledgeable Hikers?

The survey also collected information on a variety of hiker characteristics, including gender, race, education level, income, occupation, and residence (urban, rural). As noted above, hikers were classified by type (day, overnight, section, and thru) and by trail region. Statistical tests were conducted to test for differences in knowledge of minimum impact skills and practices by these hiker characteristics. Very few statistically significant differences were found, with most differences related to hiker type and region of the trail. For example, 68% of respondents from the northern regions of the trail knew that they should camp at least 100 feet from an established trail compared to less than 50% of respondents from the southern regions of the trail. Respondents from the southern regions also scored lower (72%) than respondents from the northern regions (87%) on the questions concerning construction of temporary fire rings.

Conclusions

Information and education represent attractive management practices that can potentially reduce the ecological and social impacts of recreation while maintaining visitor freedom of choice. However, effective dissemination of information and education can be challenging, especially on the AT where visitors are widely distributed across more than 2000 miles of trail and among multiple management agencies and organizations. However, our study indicates that most hikers on the AT are relatively well-informed about a variety of minimum impact skills and practices, especially when compared to visitors in other similar studies. The average score on the 10-item quiz administered to a representative sample of hikers along the trail was 82%. This is substantially higher than similar studies administered elsewhere (e.g., Confer et al., 2000; Cole et al., 1997). This may suggest that hiker information and education programs are becoming more effective.

Despite the generally high knowledge levels of AT hikers, study findings may suggest several strategies that can continue to enhance the effectiveness of information and education programs. For example, additional emphasis might be placed on the need to disperse camping in lightly used areas and the need to camp at least 100 feet from an established trail. Books and magazines, visitor centers and ranger stations, and trail clubs may be the most effective sources of information on minimum impact skills and practices. Day use hikers and hikers in the southern regions of the AT may be especially important targets for additional information and education on minimum impact skills and practices.

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WHO CARES AND WHO ACTS? DIFFERENT TYPES OF OUTDOOR RECREATIONISTS EXHIBIT DIFFERENT LEVELS OF ENVIRONMENTAL CONCERN AND BEHAVIOR[1]

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Abstract: The relationship between a person's level of environmental concern and behavior, and their participation in different types of outdoor recreational activities has been a matter of study for approximately 25 years. However, most of the research occurred in the mid- to late seventies and, until recently, there has been relatively little research performed since then. A recent study notes that the weak associations found in earlier studies between environmental concern/behavior, and outdoor recreation participation may explain the drop in research effort. We revisit the issue because it has important policy dimensions. The results generally support the idea that participation in outdoor recreation can have a significant positive impact on the level of environmental concern and behavior. In addition, the level of environmental concern and behavior depends upon the type of recreational activity. The general trend is that appreciative activities, such as wildlife watching and nature photography, are consistently associated with higher levels of environmental concern and behavior. However, the relative effects of the different recreation activities differ across our measures of environmental concern and behavior. Thus, the idea that the direction of the effects is consistent across alternative measures is not supported.

Introduction

The relationship between a person's level of environmental concern and behavior, and their participation in different types of outdoor recreational activities, has been a matter of study for approximately 25 years. The studies have primarily examined the following two hypotheses elicited by Dunlap and Heffernan. First, there exists a positive association between participation in outdoor recreation activities and environmental concern, and second, that the strength of this association is different across types of outdoor recreation. A major difference between the various studies is how different recreational activities are grouped.

Most of the research occurred in the mid- to late-seventies with relatively little research performed since then. A recent study notes that the weak associations found in earlier studies between environmental concern and behavior, and outdoor recreation participation may explain the drop in research effort. We revisit the issue because it has important policy dimensions; if environmental concern and behavior is significantly impacted by participating in various outdoor recreational activities, then policies and programs promoting these activities may be effective in furthering environmental agendas.

Notably, the relatively weak associations found in previous work may depend critically upon the method in which recreational activities were grouped. We examine the statistical relationship between pro-environmental behavior or attitudes and participation in different types of outdoor recreation. Further, we do not group activities so that we can test if the relationships are significantly different across recreation type.

Relevant Literature

Dunlap and Heffernan (DH, hereafter) (1975) classified recreation activities into two categories: 'consumptive' defined as those activities (such as hunting and fishing) which involve "taking something from the environment and thus reflect a 'utilitarian' orientation toward it" (p. 19) and "appreciative" defined as those activities (e.g., hiking, camping and nature photography) which involve "attempts to enjoy the natural environment without altering it...thus compatible with the 'preservationist' orientation which attempts to maintain the environment in its natural state" (pp. 19-20). Using this grouping scheme DH found that the first hypothesis received only weak support and that the second received substantial support. They discovered that the association between various indicators of environmental concern was always stronger with appreciative activities than with consumptive activities.

Geisler et al. (1977) altered the original DH approach by including a third category of outdoor recreation activities, "abusive." Recreation activities such as ATV riding, snowmobiling, and mountain biking are classified as "abusive" by DH, although not specifically examined in their study, and defined in their paper as activities which produce "severe environmental degradation" (p. 27). Using their approach, Geisler et al. found significant support for the first hypothesis albeit the effects measured were relatively small. They also found some statistical support for the assertion that participation in appreciative activities has a stronger positive association with environmental concern than participation in consumptive activities. However, the results were decidedly mixed when considering abusive activities; the effect of abusive activities was similar to the effect of appreciative activities and similar to or greater than the effect of consumptive activities.

Van Liere and Noe (1981) also examined the DH hypotheses but their study differed by using different measures of participation intensity. They did not find strong support for the first DH hypothesis; only about 40 percent of the associations between environmental concern and recreational participation were significant and positive.

[1] Maine Agriculture and Forest Experiment Station No. 2482.

In addition, about 15 percent were significant and negative. The results did provide support for the second hypothesis; all of the significant positive associations were with respect to appreciative activities.

Theodori et al. (1998) also examined the second DH hypothesis with an even more significant alteration to the grouping of outdoor recreation activities. They identified a limitation of prior studies' classification of recreational activities; some activities (such as camping or hiking) may transcend two or more categories. While some of these activities had been historically categorized as "appreciative", these activities were also impact intensive and could therefore fall into the "consumptive" definition. They re-classified the various outdoor recreation activities into 2 categories: "Appreciative-Slight Resource Utilization" characterized by participation in activities such as hiking/backpacking, picnicking, and bird watching and "Moderate-Intensive Resource Utilization" identified as participation in such activities as fishing, hunting, and ATV riding. The study found considerable support for the first Dunlap-Heffernan hypothesis and showed mixed results for the second hypothesis.

In summary, the various studies examining the DH hypotheses show varied results possibly due to the somewhat arbitrary classification of outdoor recreation activities. Rather than arbitrarily classify the various outdoor recreation activities into delineated categories based on the so-called environmental impact of these activities, the recreation activities should be examined individually to ascertain the connection between them and environmental concern and behavior.

Model

We are interested in estimating the relationship between an individual's level of environmental interest, opinions and behavior with their participation in different forest recreational activities. In turn we estimated four different equations, each with similar sets of independent variables but with different dependent measures of environmental interest, opinions or behavior. More specifically, the equations estimate the relationship between participation in forest-based recreation and 1) the individual's level of interest in how forests are managed, 2) the individual's opinion as to what percent of U.S. forests are managed in an 'environmentally friendly' manner, 3) the individual's level of membership or support of environmental groups, and 4) the individual's likelihood to purchase an environmentally certified and labeled wood product.

The general form of the equations is:

$$DEP = (\Sigma\alpha_{INT}INT) + (\Sigma\beta_{ACT}ACT) + (\Sigma\delta_{SOC}SOC) + (\Sigma\phi_{REG}REG) + (\Sigma\gamma_{RTREAT}TREAT) + e$$

where the dependent variable differs across equations (explained in more detail below) and the INT denotes the equation intercept(s).[2] ACT denotes a set of variables that denote whether the individual did or did not participate in forest-based recreation (NOREC) and if they did, what specific forest-based recreational activity (HIKE, FISH, XSKI, WATCH, ATV, CAMP, HUNT, SNOW, PHOTO, BOAT) they participated in (hiking, fishing, cross-country skiing, wildlife watching, riding all-terrain vehicles, camping, hunting, snowmobiling, nature photography or boating/canoeing, respectively). When the individual did not participate in any forest-based recreational activities then NOREC was coded 1; 0 otherwise. All other ACT variables were coded 1 if the individuals participated in the specific activity; 0 otherwise. SOC denotes a vector of variables (GEN, RACE, AGE, ED, INC, ACRES) that denote the individual's socioeconomic characteristics (gender, race, age, education, household income, and acres of forestland owned, respectively). GEN is coded 1 if the individual is male; 0 otherwise and RACE is coded 1 if the individual is white; 0 otherwise. ED and INC are categorical variables that have been recoded to measure the individual's level of education (in years) and income (in dollars), respectively. AGE and ACRES are continuous variables that measure the individual's age (in years) and ownership of forestland (in acres). REG denotes a vector of variables that denote where the individual lives. TREAT denotes a vector of variables (used only in equation four) that are used to control for any experimental treatments used within the survey design. More specifically, the information presented on the environmentally labeled wood product differed across individuals; in total there were 16 different information treatments.[3]

The equations differed in terms of the dependent variables (and corresponding treatment of intercept terms). In the first equation we estimate the relationship between the individual's level of interest in how forests are managed and the independent variables. For this equation the dependent variable is based upon responses made on a rating (Likert-type) scale where 1 denoted that the individual was 'not at all interested', 3 denoted that the individuals was 'somewhat interested' and 5 denoted that they were 'very interested'. In the second equation we estimate the relationship between the individual's opinion as to what percent of U.S. forests are managed in an 'environmentally friendly' manner. Here, the dependent variable is based upon responses made on a rating scale with five-points: 0, 25, 50, 75 and 100 percent. In the third equation we estimate the relationship between the individual's level of membership or support of environmental groups and the independent variables mentioned above. For this equation the dependent variable is coded 1 if the individual stated that they donated money to, or belonged to, any environmental groups; 0 otherwise. In the final equation we estimate the relationship between an individual's likelihood to purchase an environmentally certified wood product. The dependent variable here is based upon responses made on a rating scale where 1 denoted that the individual was 'highly unlikely' to buy the product, 3 denoted the individual had 'no opinion either

[2] The number of intercepts is different across equations and is dependent upon the form of the dependent variable.

[3] For brevity we will not fully discuss the experimental design for equation four (which is the subject of an entirely different analysis). Interested reader can contact the first author for more information.

way' and 5 denoted they were 'very likely' to buy the product.

Given the dependent variable in the third equation is binary we estimate this equation using binary logit regression. The dependent variables in the remaining equations are ordered and thus we use ordered logit techniques. Typically, binary logit models have one intercept while ordered logit models have one less intercept than the total number of ordered categories in the dependent variable. Thus, the first equation would have one intercept and the other three equations would have four intercepts. However, the vector of region variables creates singularity problems if the full complement of intercepts is allowed. As a result, one intercept is dropped from each of the four equations.

The estimated equation parameters with appropriate variable coding can be used to provide estimates of the various dependent variables for different types of forest recreation participants while holding all other modeled variation constant. That is, we use the equations to estimate how participation in different types of forest-based recreation affects the individual's level of environmental concern and behavior while controlling for other individual (e.g., socioeconomic and residence) and experimental variation. Furthermore, we test the equivalence of individual pairs of parameters (e.g., $\beta_{FISH} = \beta_{HUNT}$), to determine if the effects of recreational activities are significantly different from each other.

Data

We obtained a sample of 3,290 U.S. adult residents from International Communications Research of Media, Pennsylvania. They conducted a telephone screening survey, using random-digit dialing (RDD), during the spring of 2000 to identify potential mail survey respondents. The sample design consisted of a nationally representative group of adults with an additional over-sample of New England and Maine residents. Except for the over-sampling, the randomness of the dialing process should produce a sample similar to one drawn through the use of probability sampling if there is no telephone non-coverage bias in the area under study and there is no non-response bias.[4]

During the summer of 2000 we conducted a mail survey of the pre-recruited respondents. The survey was administered in three waves; a five-dollar incentive (paid when individuals returned their survey) was provided to increase response. In total 1,948 individuals responded to the mail survey and 36 were returned as undeliverable for a response rate of 60 percent (1,948/3,290-36).[5]

[4] All analysis is weighted to correct for the over-sampling.

[5] The surveys were mailed under a nonprofit organization permit and thus we were not supposed to receive undeliverable returns (unlike a first class mailing). As a result, the count of 36 undeliverables is likely to be an underestimate of the actual number of undeliverables.

Results

The presentation of the results is divided into two sections. The first section presents a descriptive overview of the data used in the regressions. The second section presents results derived from the regression equations

Descriptive Overview

In general our resulting sample of survey respondents is relatively representative of the characteristics of the U.S. adult population (Table 1). Our sample is slightly older, more likely to be white and have slightly more education on average.

Table 1. Socio-economic Characteristics of Survey Respondents and of U.S. Adult Population

	Survey respondents	U.S. adults
Gender (percent male)	48	48
Average age	46	44
Race (percent white)	84	80
Average education	14.2 years	12.9 years
Average household income	$54,400	$54,800
Average number of acres of owned forestland	5.0	-.-

Almost all of the respondents were somewhat to very interested in how forests are managed and almost three-quarters of the respondents indicated that they thought that at most half of the forests in the U.S. are managed in an environmentally friendly manner (Table 2). However, less than a quarter of the respondents indicated that they donate money, or belong to, an environmental organization. Most respondents stated that they were likely to consider buying an environmentally certified wood product assuming that the product quality and price are equal to products not environmentally certified.

Regression Results

The presentation of the results will follow in five subsections; the first four subsections will present specific findings relevant to each of the four equations. The last section will then present general findings cuttings across all of the equations. Given the number of parameters involved and the difficulty in interpreting individual parameter estimates we will not present a fully detailed presentation of each equation. Instead, we use the estimated regression equations, with appropriate variable coding, to provide estimates of the probability that a particular value will occur for the dependent variable (e.g., to predict the probability that the dependent variable for the first equation is 1, 2, 3, 4 or 5). The coding for the recreation variables vary across each of the recreational activities, however, the variable coding is constant for all other variables, generally being set at the mean values. Once the probabilities for each of the dependent values are calculated across recreation activities then we use these probabilities, along with the associated values of the dependent variables, to calculate the expected value for the dependent variables for each recreation type.

Table 2. Characteristics of the Measures of Environmental Concern and Behavior

Level of interest in forest management	(percent stating)
1 = Not at all interested	2
2	6
3 = Somewhat interested	36
4	26
5 = Very interested	30
Opinions regarding the percent of U.S. forests managed in an environmentally friendly manner	(percent stating)
0 = None	1
25 = Some	37
50 = Half	38
75 = Most	22
100 = All	2
Percent donating money or belonging to an environmental organization	23
Likelihood of purchasing an environmentally labeled wood product	(percent stating)
1 = Highly unlikely	4
2	6
3 = No opinion either way	28
4	26
5 = Very likely	36

Before continuing to the results, it is important to understand that the above procedure provides the expected value of the dependent variables across recreational activities while *holding all other variation constant.* Income, age etc. does not vary across recreation types. In addition, one must be careful to understand that the results of the analysis assume that a participant in a particular recreation activity does not participate in any of the other activities. Differences in the expected values across recreation activities are solely driven by changes in the type of recreation. Thus, it is incorrect to take the result for any recreation type and interpret this result as being indicative of participants in that activity because they have the ability to participate in multiple activities. For example, one should not take the result for 'hunting' and interpret this result as being indicative of hunters; hunters may also fish, camp or hike. Further, it is incorrect to interpret differences across recreation types as being indicative of differences between participants in those activities; the reason is that the average participant for each of the activities may be quite different in terms of other individual characteristics. For example, one should not interpret differences between 'hunting' and 'wildlife watching' results as being indicative of differences between the average hunter or wildlife watcher because hunters and wildlife watchers differ significantly in terms of gender (74 percent of hunters and 48 percent of wildlife watchers are male). The strength of the analysis here is this ability to hold other variation constant; it allows the identification and measurement of the marginal effect of participating in each recreational activity on the level of environmental interest and behavior.

Effect on the interest in forest management - Wildlife watching, nature photography, snowmobiling and hunting are the activities that have the strongest effect on increasing an individual's interest in how forests are managed (Figure 1). In addition to the above, participating in hiking, fishing and camping also increases an individual's interest in how forests are managed relative to not participating in any forest-based recreation. The interest in forest management associated with the other activities (ATV riding, boating and cross-country skiing) is no different than the interest level of an individual who does not participate in any forest recreation. Wildlife watching and nature photography are activities associated with significantly higher interest levels than fishing, camping, ATV riding and boating. In addition, the effect of wildlife watching is also significantly higher than that of hiking.

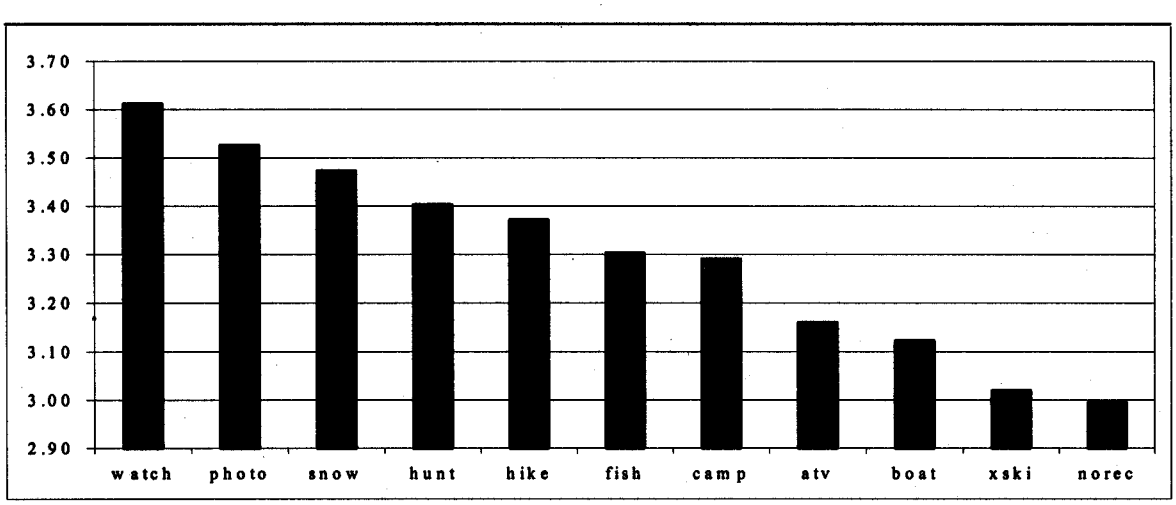

Figure 1. Level of Interest in Forest Management across Forest-based Recreational Activities
5 = Very interested, 3 = Somewhat interested, 1 = Not at all interested

With respect to previous work, we find that activities that have been traditionally classified as appreciative (wildlife watching and nature photography) have a greater positive impact on the interest level for the ways forests are managed. However, the effects of snowmobiling, an 'abusive' activity and hunting, a 'consumptive' activity, are not significantly different than the two appreciative activities.[6] Further, we find that camping and hiking, sometimes classified as appreciative, are significantly different than wildlife watching and/or nature photography.

Effect on respondent opinions regarding management of U.S. forests - Snowmobiling and fishing are activities associated with increasing respondent opinions that a greater percentage of U.S. forests are managed in an environmentally friendly manner, all else equal (Figure 2). Wildlife watching, cross-country skiing, camping, nature photography and hiking are associated with individuals thinking that a lower percentage of U.S. forests managed in an environmentally friendly manner. However, only hiking is associated with an effect that is significantly different than not participating an any forest-based recreation.

Effect on the likelihood to participate in an environmental organization - Again, wildlife watching is the activity that has the strongest effect on increasing the individual's likelihood to donate money to, or belong to, an environmental organization (Figure 3). In fact, except for snowmobiling, participating in any forest-based recreation is significantly associated with increasing the individual's likelihood to donate money to, or belong to, an environmental organization. In addition, wildlife watching, cross-country skiing, hunting, nature photography, hiking and boating are all significantly different than fishing and snowmobiling in increasing the likelihood that an individual donates money to, or belongs to, an environmental organization. In addition, the effect of wildlife watching is significantly greater than the effect of ATV riding, camping, boating and hiking.

Again we find that activities that have been traditionally classified as appreciative (wildlife watching and nature photography) have a strong positive impact on environmental behavior or concern. However, the effect of hunting, a 'consumptive' activity, is not significantly different than the two appreciative activities. Further, we find that camping and hiking, sometimes classified as appreciative, are significantly different than wildlife watching. Finally, hunting is found to be significantly different than fishing, another consumptive activity.

[6] Of course the reason that these four activities increase interest levels may not be the same across the activities. For example, the positive effect of hunting and wildlife watching may both be due to concerns about forest management's effect on animal populations, however, the object of interest may be quite different. The positive effect of snowmobiling may be due to concerns about land access.

Effect on the likelihood to purchase an environmental product - Wildlife watching is the activity that has the strongest effect on increasing the individual's likelihood to purchase an environmentally labeled wood product (Figure 4). Further, wildlife watching is significantly different than camping, fishing, ATV riding, hunting, and snowmobiling. However, boating, hiking and nature photography all have significant impacts relative to not participating in any forest-based recreational activity, and are also different than hunting and snowmobiling. Camping and fishing are also significantly different than hunting and snowmobiling. Again we find that hunting is found to be significantly different than fishing, another consumptive activity.

General results - Several results can be obtained when comparing the results across each of the four equations. First, the results generally support DH's first hypothesis; participation in outdoor recreation can have a significant positive impact on both the level of environmental concern and on the level of environmental behavior. In all four equations, there were several forest-based recreational activities that had effects significantly different than that of the no recreation case. Second, the level of environmental concern and behavior depends upon the type of recreational activity. For example, the effect of wildlife watching was significantly different than that of fishing in all four equations. Third, the relative effects of different recreation activities differ across our measures of environmental concern and behavior. For example, we find that hunting is associated with a greater level of environmental behavior relative to fishing when the measure is the likelihood of donating money or belonging to an environmental group. However, the opposite is true when the measure is the likelihood of purchasing an environmentally labeled wood product.

Thus, the second DH hypothesis is only partially supported. That is, the idea that different recreational activities have different effects on the level of environmental concern and behavior is supported. Further, the general trend is that appreciative activities such as wildlife watching and nature photography are consistently associated with higher levels of environmental concern and behavior. However, the idea that the direction of the effects is consistent across alternative measures is not supported.

Finally, the effects of the second and third points above imply that the traditional approach of aggregating activities may be of concern. For example, in previous studies hunting and fishing were combined together as 'consumptive activities'. However, here we find that for two of our four measures the effects of hunting and fishing are significantly different from each other. This suggests that specific recreation activities should be analyzed individually so as to accurately determine how different recreational activities effect the level of environmental concern and pro-environmental behavior.

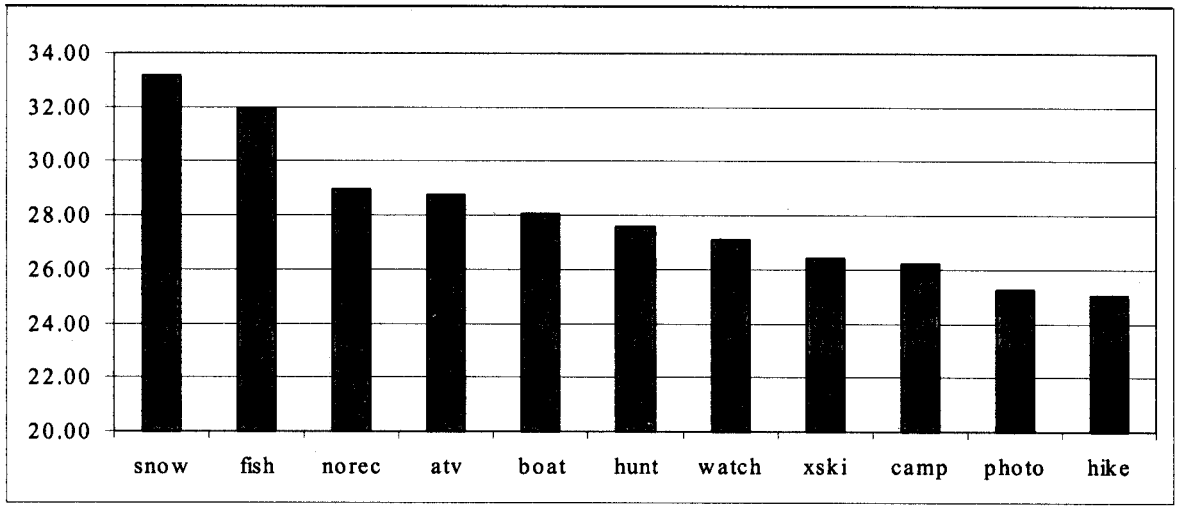

Figure 2. Respondent Opinion Regarding the Percent of U.S. Forests Managed in an Environmentally Friendly Manner across Forest-based Recreational Activities

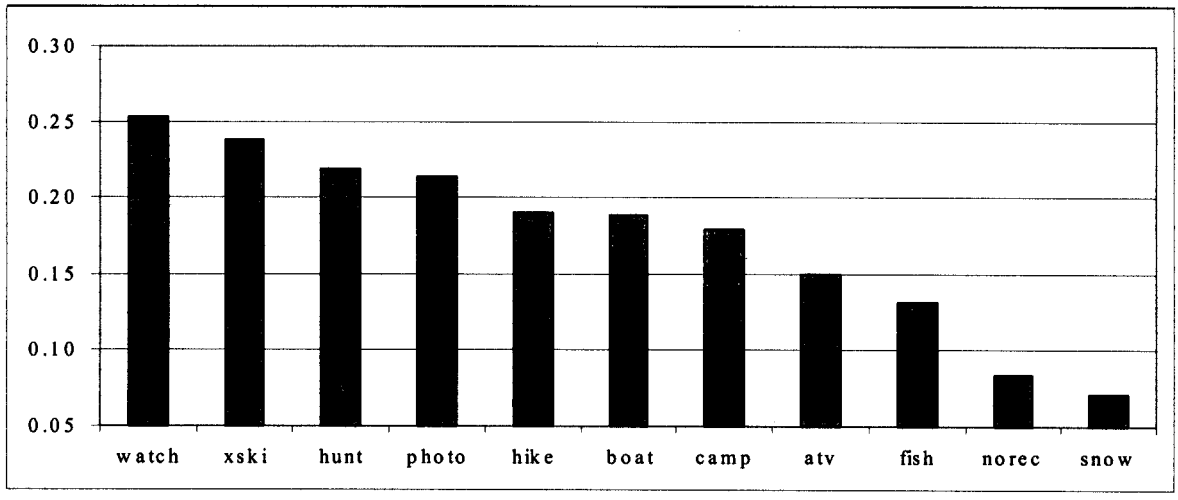

Figure 3. Percent of Respondents Indicating They Belong to, or Donate Money to, Environmental Organizations across Forest-based Recreational Activities

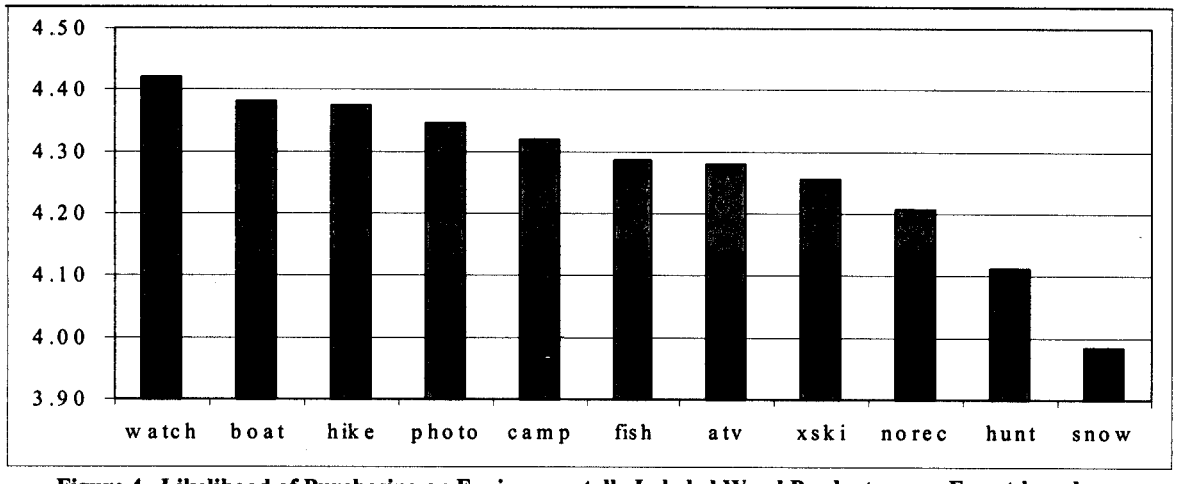

Figure 4. Likelihood of Purchasing an Environmentally Labeled Wood Product across Forest-based Recreational Activities (5 = Very likely, 3 = No opinion either way, 1 = Highly unlikely)

Conclusions

The results are contingent upon our measures of environmental behavior/concern, as well as our measures of participation in recreational activities. Specifically, we asked individuals if they had participated in specific recreational activities during the past year. Although our measures are probably correlated with the intensity of participation, we did not collect data specifically measuring participation intensity. The relative effects of the different recreational activities may be strengthened or weakened if we had accounted for the intensity of participation.

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VISITOR BEHAVIOR AND RESOURCE IMPACTS AT CADILLAC MOUNTAIN, ACADIA NATIONAL PARK

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Abstract: The summit of Cadillac Mt., located in Maine's Acadia National Park, can be reached via three hiking trails and a scenic auto road. This site attracts over an estimated two million visitors per year. Most of this visitation is concentrated from Memorial Day to Labor Day. The sensitive sub-alpine nature of the site, coupled with high visitation rates, has created a scenario where significant vegetation and soil damage occurs. Additionally, Acadia National Park has experienced chronic problems at this site stemming from visitors altering, destroying, or constructing cairns (piles of rocks built by trail crews to mark trails and guide hikers).

In an attempt to describe visitor behaviors and the context in which those behaviors occur, an unobtrusive, observational study was conducted on the summit of Cadillac from June 19, 2000, through October 4, 2000. Field observation periods totaled 219 hours and were performed on 31 weekdays and 9 weekend days. The primary observer's researcher role was concealed by appearing to look like a hiker, nature enthusiast, reader, or tourist. Observations of visitors' actions and comments, recorded during stationary and roving observation periods, were subtlety recorded in a small, inconspicuous journal.

To analyze the data, field note entries were organized into general categories. Individual entries were coded for specific themes or patterns identified by constantly comparing and analyzing the entries. Emerging theories/hypotheses, which were borne out of (or grounded in) recorded data, are discussed in relation to potential management approaches.

Most impacts to the site occur in a positive social atmosphere. Damaging behaviors such as cairn building and trampling did not appear to show malicious or even rebellious intent. Cairn building was most attributable to families with preadolescent children. Findings identified numerous factors influencing off-trail travel (e.g. personal space, photography, picnicking, etc.). Furthermore, insight was gained regarding how visitors react to low-impact messages (on signs) and to physical barriers erected to protect damaged areas.

Future research and management considerations are put forth based on the results of this study. Particular emphasis is given to persuasive communication. The influence of high visitation rates on several potential management strategies is discussed.

Introduction

The attractiveness of Acadia National Park, located primarily on Maine's Mount Dessert Island, has led to an extremely high level of visitation. Acadia National Park is within a day's drive of roughly twenty-five percent of the United State's population. In 1999, Acadia National Park received 2,602,227 recreation visits, the 8th highest visitation level of all National Parks in the U.S. (NPS, 2001). According to the 1998 Visitor Services Project (NPS, 1998a), 76% of visitors to Acadia National Park visited the summit of Cadillac Mountain. Cadillac Mountain, the location of this study, is the highest point along the eastern coastline of North America. At 1530 feet high, it is claimed by some to be the first point in the United States hit by the rising sun. Cadillac, with its dome-like granite form, glacial history, shrub vegetation, magnificent views, and open summit, draws millions of visitors per year. Furthermore, the bulk of these visits come during the 100 days from Memorial Day to Labor Day.

In looking at visitation to Cadillac's summit, it is important to understand the access routes leading to the summit. An extremely popular scenic auto road accessing the summit is open to the public for approximately six months a year. Also, there are three hiking trails leading to the summit. The North Ridge Trail is a 2.2-mile (one-way) hiking trail. The South Ridge Trail, approaching the summit from the opposite direction, is 3.7 miles (one-way). Finally, the Gorge Path Trail approaches the summit from the north, with the final approach being a steep climb out of the Gorge between Cadillac Mountain and Dorr Mountain.

There is a day-use parking area atop Cadillac. This lot, connected to the summit auto road, has space for approximately 70 cars. There are also designated spaces for visiting tour buses and commercial tour companies. A gift shop is located on Cadillac's summit. This shop, run by the non-profit Eastern National Corporation, houses a set of public restrooms.

The Cadillac Summit Trail is a 2118-foot long paved trail that loops around the immediate summit of Cadillac. There are four interpretive panels and two paved viewing pads located along the trail. None of the current panels discuss vegetation impacts to the summit area.

The dominant vegetation type, in relation to the developed/semi-developed summit area, is "Blueberry Bald-Summit Shrubland Complex." One of the characteristics of areas falling into this community category is openness. On the summit of Cadillac, areas within this community boundary are open, with patches of low or shrubby vegetation amongst areas of exposed granite bedrock (that are frequently covered with crustose lichen). Sub-alpine plant communities such as this are considered rare by the Maine Natural Heritage Program and are state critical areas (NPS, 1998b). On Cadillac's summit, there is

a profusion of areas where vegetation has been worn away by foot traffic and only soil remains. The soil resembles grape-nuts cereal; it is composed of tiny granite pebbles and grains of sand. The sand and pebble soil patches, in some cases, are underlain by peat-based soil.

Resource impacts to Cadillac's summit have not gone unnoticed by park managers. The Resource Management Plan for Acadia National Park (1998) makes the following statements about visitor use and resource impacts:

> Increasing visitor use in the Park is impacting vegetation. Plants in sub-alpine habitats on mountain summits and offshore islands and Park bogs and wetlands are particularly sensitive to trampling. Soil compaction and/or erosion, destruction of vegetation, and development of social trails have all been observed in these fragile habitats. Habitat restoration, long term monitoring and visitor management is needed to protect these areas.
>
> Concentrated visitor use in the front country is also having a negative impact on vegetation. Trampling of soils and plants is occurring along roadside and parking areas due to crowded overflow conditions in summer. Social trails have also developed at many heavily visited sites. Habitat restoration and visitor management is critically needed to repair degraded conditions.

The summit of Cadillac is especially impacted due to the fact that it is both a sensitive sub-alpine area and a heavily visited front country site. The Resource Management Plan specifically cites Cadillac's summit as a site where social trails have caused erosion. However, due to the limited size of the summit area and the high number of visitors, visitors to Cadillac's summit are not asked to stay on trail. Instead, visitors are encouraged to use low-impact off-trail skills (i.e., walk only on rocks) if they choose to venture off-trail.

Cairns, pyramid shaped piles of rocks built by trail crew to mark trails and guide hikers, are another resource concern at Cadillac. Park managers have continually had to deal with cairns at Cadillac being altered by visitors. Specifically, some cairns would be destroyed, others would have rocks added to them, and visitors would inappropriately construct others. As a result of visitors inappropriately interacting with cairns, it is, in places, difficult to follow the actual trails. This in turn leads to trampling impacts and safety concerns (e.g., visitors potentially getting off-trail and lost, especially in fog). Inappropriate cairn building can "clutter" scenic vistas. Additionally, removing stones from the soil to build or add to cairns can lead to soil erosion and loss of plant "micro-habitat" (Hampton & Cole, 1995).

Resource protection efforts on Cadillac during the 2000 season consisted of ranger-led interpretive walks and area closures defined by "exclosures," wooden fence-like structures encircling three areas. The exclosures, erected in early August, were complimented by generic (i.e., not site specific) revegetation signs. Later, in September, new signs specifically designed for Cadillac were placed on site. In a few locations, the barriers, which cumulatively made up exclosures, were used individually. These barriers, that looked somewhat like saw horses, were placed in locations where visitors frequently ventured off-trail. Exclosure designs varied slightly. One exclosure had relatively large "gaps" between the individual barriers that made up the exclosure. The other two exclosures were created in such a way that the barriers were either contiguous or closely spaced.

The interpretive programs were not specifically centered on low-impact education, though visitors were made aware of impacts and were asked not to step on vegetation and bare soil. It should also be noted that the park promoted park-wide low-impact behavior by communicating the principles of the Leave No Trace program in some trailhead signs and in the Beaver Log, the Park newspaper. The signs placed on site in September also used Leave No Trace messages (e.g., walk on rocks) and logos.

The objective of this research is to increase understanding of visitor impacts on summit area resources using observational research methods. Two initial concerns, visitor manipulation of cairns and trampling of vegetation and bare soil, guided observations. Research findings were intended to help park managers better understand visitor use and how damaging visitor behaviors might be managed.

Methods

This study used unobtrusive observation as a tool for gathering qualitative (non-metric) data. An observer, whose identity was concealed by appearing to look like a tourist or hiker, recorded visitor behaviors. The observer did not purposefully interact with visitors. Observation periods ranged in length from 2 hours to ten hours (with periodic breaks). Total observation hours, logged during 31 weekdays and 9 weekend days from June 19, 2000, to October 4, 2000, equaled 219 hours.

Field notes were recorded in a small sketchbook. Note taking occurred during stationary observation periods. Observations collected while roving around the site were recorded later, either during stationary observation periods or in a vehicle shortly after a day's observations. At the close of each day, a summary sheet was filled out. Summary sheets helped organize data for retrieval during later periods of data analysis.

The primary sampling approach used was purposive sampling. Purposive sampling is explained by Erlandson et al. (1993) in the following excerpt:

> Central to naturalistic research is purposive sampling. Random or representative sampling is not preferred because the researcher's major concern is not to generalize the findings of the study to a broad population or universe but to maximize discovery of the heterogeneous patterns and problems that occur in the particular

context under study. Purposive and directed sampling through human instrumentation increases the range of data exposed and maximizes the researcher's ability to identify emerging themes that take adequate account of contextual conditions and cultural norms.

The observer chose to record behaviors and overheard comments based on the problems initiating the research. As More (1984) writes, "What you observe is spelled out in the definition of the problem." Kellehear (1993) uses the term ad libitum sampling to describe sampling that is "impressionistic and non-systematic" where "the observer simply records what is of interest." This research employed ad libitum sampling.

Data Analysis

The data analysis approach used in this study was based on the principles of grounded theory. Grounded theory requires that researchers discover concepts and hypotheses through an inductive process involving constantly comparing exhaustive categories that explain the data (Frey et al., 2000; Glesne, 1993). As part of this process, notes were "openly" coded. Coding is the task of discovering or discerning themes and giving those themes names (Kellehear, 1993). Coding can take two forms; closed coding creates predetermined categories before data gathering while open coding creates categories during or after data gathering (Frey et al., 2000). In keeping with this study's exploratory, grounded theory approach, open coding was used. Once the data was organized by topical categories and a hard copy was printed, the hard copy was analyzed by reading and rereading groups of entries. Numerous notes and markings were made in the margins of the hard copy print out. New codes were created to represent emerging themes, patterns, and ideas. Entries had evolved from being organized by topic (e.g., photography, cairn comments) to theme (e.g., "disconnect"-entries that displayed a disconnect between a visitor's comments and actions). These new thematically organized entries were compared to entries within their category and to entries placed in other thematic categories. With data organized first around topics and then around themes, the data was examined and interpreted findings that were of importance to park management were pulled out.

Results

Patterns emerged from the data and were constantly evaluated. Downing and Clark (1985) claim that naturalistic, grounded methods are capable of rapidly developing and refining hypotheses that are likely to survive the rigors of verification. This capability stems from grounded hypotheses being borne from analysis of new data. With this in mind, the following list of summarized findings is put forth. These bulleted items are working hypotheses generated and evaluated through data collection and analysis. They are the stronger findings relating to the problems that initiated this research.

Cairns

- Young children (pre-adolescents) are the predominant group responsible for building and destroying cairns.
- Family members support children who engage in cairn building. Cairn building occurs in a positive family context.
- Children are NOT the only group observed adding stones to cairns; adults also add stones to cairns.
- The effects of visitors building and/or destroying cairns leads to some other visitors being confused and/or having trail experiences diminished.
- Understanding the role cairns play decreases the likelihood of cairn modification (adding stones was the activity that data from this study identified, though it is plausible that understanding also influences the likelihood of cairn building and destroying as well).
- Cairns are intrinsically attractive in that they have an allure to those who are seeing them for the first time (irrespective of who built them).
- By building cairns atop Cadillac and not explaining their purpose *on-site*, park managers actually instigate additional cairn building by visitors.

Trampling and Off-trail Travel

- Trampling acts off-trail far outweigh low-impact off-trail acts (walking only on rocks), even after signs are placed on site.
- Reasons for visitors going off-trail include: gaining personal space, visiting attractions such as interpretive panels and rock formations, returning to their vehicles via the shortest path, taking photographs, picking blueberries, generally exploring.
- Some visitors prefer to be off-trail, regardless of how much space is available on the Summit Trail (including the paved viewing pads).
- A number of visitors do not understand the layout of the site. In particular, many visitors do not recognize that the Summit Trail is a loop. This lack of understanding may influence their decision-making process about going off-trail.

Impact Perceptions

- Visitors do not often recognize that patches of barren soil are the result of foot traffic.
- Visitors occasionally refer to social trails as "paths" or "trails", apparently identifying social trails as sanctioned.

Physical Barriers

- Lone barriers are ineffective in protecting significant areas of vegetation, even when signed.
- "Tightly" designed exclosures are very effective in reducing impacts *within* their perimeters.

- Exclosures push impacts around their perimeters.
- Visitor experiences at the summit do not appear to be diminished by the exclosures.
- Many visitors "narrowly" conceptualize the purpose of exclosures. These visitors perceive that the exclosures were placed on site to protect the specific areas within their perimeter, and that other areas do not merit concern.
- Many visitors either do not read the signs on the exclosures at all, or they only briefly glance at the sign.
- Some visitors ascribe meaning to the exclosures without reading the sign.

Low-impact Skills and Knowledge

- Some visitors do not recognize the difference between gravelly soil and true rock surfaces, thereby misunderstanding the "walk on rocks" message.
- Many visitors have a threshold for low-impact techniques; they will follow low-impact guidelines up to a point at which they abandon the techniques in favor of personal needs or wants.
- Some visitors are physically unable to follow the "walk on rocks" guideline.

Creativity and Play

- Playful, tactile interactions with the physical resources on site are a significant component of youths' experiences at the summit.

Discussion

The findings of this study provide valuable insight for persuasive communication efforts on Cadillac. One major pattern to emerge from the data is that willfully depreciative behaviors, those actions that visitors engage in knowing full well that they are causing significant damage, were rarely seen. Therefore, most damaging behaviors are not malicious or flagrant but rather unskilled, uninformed, careless, or unavoidable. Hendee et al. (1990) assert that unskilled actions and uniformed actions are (correspondingly) highly and very highly receptive to change through persuasion. Many problem behaviors seen at Cadillac's summit fit into one of these two categories. Thus, in August and again in September, when the park established signs on-site detailing the need for low-impact behaviors, observations of positive behaviors should have gone up. However, they did not. Comments about, for example, "walking on rocks if off-trail" did become more frequent, but the actual behaviors were not seen more than before the signs went up (or much at all for that matter). Furthermore, the exclosures seemed to influence some visitors to think that only specific areas were impacted and in need of delicate treatment (in fact, all of the summit, except paved surfaces and exposed bedrock, is delicate, vulnerable, and impacted).

One possible reason why low-impact messages on signs were not extremely successful relates to the atmosphere at the summit. The summit is a busy place with a lot of visitors, natural attractions, and non-natural "curiosities" (e.g., visitors with unique cars, marriage ceremonies, a gift shop, etc.). And placed within this atmosphere were signs that required visitors to read them, digest the information, accept the sign's ethical appeal, and start following the sign's low-impact guidelines. The signs, then, used a central route to persuasion. The central route to persuasion requires the receiver of the message to attentively receive the message, elaborate on its content, and integrate the message into his or her belief system (Roggenbuck, 1992). The signs themselves, especially the signs used after September 7, were not poorly designed. However, they use a conceptual route to persuasion that requires significant personal attention in a location that is often extremely distracting.

It could be recommended that park managers employ more communication efforts that use the peripheral route to persuasion, a conceptual route that focuses on the message source, not its content (Roggenbuck, 1992). This route is based on the notion that in many situations people make quick decisions by spontaneously responding to a cue. That cue may take the form of an environmental prompt, the characteristic of a message (instead of its content), the source of a message, or the communication channel (Roggenbuck, 1992). While utilizing the peripheral route, perhaps through images such as international signage, could help reduce visitor impacts, a broader remedy may be needed.

The extremely high visitation rate at Cadillac Mountain likely confounds resource protection efforts, including efforts to educate visitors about low-impact ethics and techniques. Some site management alternatives, such as locating use on resistant sites, site hardening and shielding, and site rehabilitation are made next to impossible by current visitation rates. Similarly, visitor management alternatives such as dispersal or concentration of use are also difficult to use with visitation being so high. Reducing visitation rates may be only way to effectively protect and restore the summit vegetation on Cadillac. By limiting visitation, the site would most likely become more manageable. Visitor and site management alternatives would become more practical and effective. Education messages could be delivered in a less distracting atmosphere. Finally, with current visitation levels, even a statistically dramatic drop in damaging behaviors would leave a high level of impact. If 99 percent of visitors stayed off sensitive vegetation, then approximately 20,000 visitors would trample sensitive sub-alpine vegetation on this relatively small summit.

It would be beneficial if future research and management efforts examined potential management scenarios in a process investigating both resource protection and visitors' experiences. Management scenarios, such as closing the auto road to private vehicles (not including tour vehicles), should be examined to see how well they could protect the summit's natural resources, as well as how they would restrict and/or enhance specific visitor experiences.

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Leisure Constraints of Outdoor Recreationists

THE EFFECTS OF PERCEIVED LEISURE CONSTRAINTS AMONG KOREAN UNIVERSITY STUDENTS

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Abstract: This study is based on Crawford, Jackson, and Godbey's model of leisure constraints (1991), and examines the relationships between the influences of perceived constraints, frequency of participation, and health status in the context of leisure-time outdoor activities. The study was based on a sample of 234 Korean university students. This study provides further support for this model of leisure constraints: intrapersonal, interpersonal, and structural. The results indicated that the higher interpersonal constraints, the lower the frequency of activity participation. Moreover, the results demonstrated that highly interpersonally constrained participants tended to rate themselves lower with respect to mental heath. In addition, respondents who participated more frequently in these activities tended to give higher self-reports concerning their mental health.

Introduction

It is generally agreed that the popularity of outdoor recreational activities has dramatically increased over the last three decades. One example of the many indicators that suggest the increased popularity of outdoor activities is that, as early as 1975, over 200 colleges and universities offered courses or degrees in outdoor adventure pursuits (Hale, 1978). Since then, many factors, governmental, social, and economic, have combined to create more opportunities for outdoor recreational pursuits (McLellan, 1986). Nevertheless, many outdoor activities demand a certain level of outdoor and/or technical skill in the recreational setting. Requirements may include equipment or material as well as a geographically acceptable setting. These requirements often serve to limit or even prohibit new or continuing participation in outdoor activities (Meier, 1977; White, 1978).

Since the mid-1980s, a growing body of research has been developed to investigate what factors influence the extent of an individual's interest and participation in leisure activities. Many researchers have contributed to our understanding of the influence of constraints on leisure activity participation (Crawford & Godbey, 1987; Crawford et al., 1991; Henderson, 1991; Henderson, Stalnaker & Taylor, 1988; Samdahl & Jekubovich, 1997; Kay & Jackson, 1991; Jackson & Rucks, 1995; Jackson, Crawford, & Godbey, 1993) and they have developed a variety of conceptual and methodological approaches that serve to explicate how constraints on leisure activity might operate. Crawford and Godbey (1987) categorized constraints into three categories according to the way that they influence participation: intrapersonal, interpersonal, and structural constraints. Intrapersonal constrains involve "individual psychological states and attributes" (p. 122), interpersonal constraints are "the result of interpersonal interaction or the relationship between individuals' characteristics" (p. 123), and structural constraints are "intervening factors between leisure preference and participation" (p. 124). Crawford and Godbey were critical of traditional understandings of constraint which were assumed to play an intervening role in the leisure preference-participation relationship, as "only one of the ways in which barriers may be associated with preferences and participation" (p. 119). They also noted that these constraints may be interrelated. They suggested that an individual may experience constraint on any one of the three constraints levels. According to Crawford et al. (1991), intrapersonal constraints are the most powerful of the three types of constraints and structural constraints are the least powerful.

The benefits of participation in outdoor activities can be divided into the categories of, for example, psychological, sociological, educational, and physical, factors, and can be evaluated in this way on an individual or case-by-case basis. Such benefits as a general improvement in motor skills, strength, coordination, exercise, and balance may result from outdoor participation (Cullingford, 1979). One area of potential benefits that tends to be overlooked is the improvement in psychological fitness of the participant, in addition to physical fitness. Here, it is assumed that the factors that limit or prohibit engagement in leisure participation have a direct impact on an individual's heath, both physical and psychological.

The primary purpose of this study, therefore, has been to examine relationships between the categories of influence of perceived constraints in outdoor recreational activities among a sample of Korean university students. The following research questions have guided this study: (a) What is the factor structure of perceived constraints among this sample? (b) Does the level of perceived constraint influence frequency of participation in outdoor recreational activities? (c) Do perceived constraint factors influence self-reported health status? (d) Does frequency of participation in outdoor recreational activities influence self-reported health status?

Methodology

Selection of Respondents

Questionnaires were initially given to 1,014 individuals of all ages. For the purposes of this study, 234 university students were selected, from freshman to seniors, who had visited two national parks located in Seoul, Republic of Korea. Data collection took place during June 2000. Just over half (57.7%, N=120) of the participants were male and

just under half (41.8%, N=87) were female. The sample ranged in age from 18 to 50 years, with a mean age of 21. Approximately one third of the sample (37%, N=77) reported that they were freshmen, followed by sophomores 28.8% (N=60), seniors 20.7% (N=43), and juniors 13.5% (N=28). The household income of the sample was also diverse, with 20% (N=40) of the sample earning $20,001-$30,000, 17.3% (N=36), $30,001-$50,000, 14.4% (N=30) $10,001-$20,000, 11.5% (N=24) less than $10,000, and 4.8% (N=10) making more than $50,001 (all $ denominations in this study indicate $US).

Procedure

An on-site questionnaire was developed by the researchers and divided into four sections designed to measure perceived leisure constraint, leisure participation, and health status. The first section collected information regarding *constraints* in outdoor recreational activities. A five point Likert rating scale measuring leisure constraints, ranging from 1=has not influenced me at all to 5=has influenced completely, was used to assess the influence of each of thirty statements, as limiting or prohibiting leisure activity. The items used to measure level of constraint follow Oh and Caldwell's work (1999), based on Crawford et al.'s research (1991), that described three discrete types of constraints (intrapersonal, interpersonal, and structural constraints). In the second section, participants were asked to report their frequency of activity participation in outdoor recreational activities (e.g., hunting, fishing, camping, golf, skiing, canoeing/kayaking, etc) in a typical week. For the third section, participants were asked to report their perceived physical and mental health. These variables are adopted from the sub-scales of the Rand Medical Outcomes Study Health Survey (MOS SG-20, McDowell & Newell, 1996). In regard to physical health, respondents were asked to evaluate each of six statements with respect to *how long (if at all) their health limited their activities* using a three point Likert scale where 1=limited for more than 3 months; 3=not limited at all. For mental health, participants responded to five hypothetical questions such as: "How much of the time over the past few months have you been a very nervous person?" responding on a six point Likert scale where 1=all of the time, 6=none of the time. In the last section, individuals were asked to provide socio-demographic variables regarding their gender, age, household income, and school year.

Measures

Descriptive statistics were used to profile the sample. A principle component factor analysis with a varimax rotation was adopted to determine if there were distinct constraint dimensions among the thirty constraint factors revealed by Korean university students. Thirty constraint items in outdoor recreational activities were initially used to represent three types of constraints: intrapersonal, interpersonal, and structural. Since these three dimensions were expected to be of approximately equal importance, a varimax rotation was used to minimize the number of variables that had a high loading on a factor and to enhance the interpretability of the results. Items with an Eigenvalue greater than one and a factor loading of at least .50, were selected for each factor. The reliability of the factor dimensions was computed through the reliability procedure in SPSS for windows. A path coefficient analysis using multiple regression analyses was conducted to examine (a) whether perceived constraints and frequency of activity participation influenced physical and/or mental health; (b) whether perceived constraints influenced the frequency of activity participation.

Results

The six factors were defined as follows, "psychological" (Alpha = .85, seven items), "accessibility" (Alpha = .90, five items), "time" (Alpha = .87, five items), "partner" (Alpha = .84, five items), "facility" (Alpha = .81, two items), and "safety" (Alpha = .83, two items). Four items had a low reliability coefficient and were, therefore, deleted. The factors "psychological" and "safety" were categorized as intrapersonal constraints. The factors "accessibility," "time," and "facility" were defined as structural constraints. The factor "partner" is considered to be an interpersonal constraint. The findings verified the importance of all three distinct constraint dimensions from Crawford and Godbey's (1987) study, intrapersonal, interpersonal, and structural. For testing further research questions, we have used these three factors of perceived leisure constraint.

Next, Pearson correlation coefficients were obtained to examine multicollinearity among the variables. Since multiple factors influence health, it was anticipated that some of the independent variables would be significantly correlated. A correlation matrix, including all independent variables and dependent variables, indicates significant correlations, ranging from .060 to .627 (Table 2).

A path coefficient analysis using multiple regression analyses was conducted to further test the significance of the research questions; it included perceived leisure constraint, frequency of participation in outdoor recreational activities, and perceived health status, as well as demographic variables. Each variable was regressed on the variables upon which it was assumed to depend. The standardized beta weights are determined by the path coefficients, presented in Figure 1, taken from an analysis of the full model.

As Figure 1 illustrates, the findings indicate that frequency of participation in outdoor recreational activities was significantly influenced by income (β = .234, p = .006) and interpersonal factors (β = -.242, p = .019). In this regression model, the independent variables accounted for 23% (Adj. R^2 = .23) of the variance in the dependent variable frequency of activity participation. Thus, as people have more income, their frequency of participation in outdoor recreational activities tends to increase. Conversely, if one experiences higher interpersonal constraints, his/her leisure participation tends to decrease. This study found no significant relationship between age, gender, school year, intrapersonal, and structural constraints, on the one hand, and frequency of activity participation, on the other.

Table 1. Constraint Dimensions as a Result of Factor Analysis

Factors/Items	Factor 1 Psychological	Factor 2 Accessibility	Factor 3 Time	Factor 4 Partner	Factor 5 Facility	Factor 6 Safety
Lack of energy	.784					
No physical strength or capability	.756					
Not feeling fit enough	.734					
Not interested	.683					
Not confident	.635					
Did not enjoy before	.629					
Health-related problem	.536					
Transportation takes time		.786				
No opportunity near home		.775				
No money		.767				
Expensive fee		.756				
Cost of equipment		.665				
Busy life			.823			
Work/study to do			.789			
No time			.764			
Social commitment			.662			
Family commitment			.657			
No one teach me				.765		
Not necessary skills				.760		
No one to participate with				.695		
Don't know where to participate				.612		
Friends don't have time				.592		
Inadequate facilities					.764	
Inconvenient facilities					.737	
Afraid of getting hurt						.847
Safety						.757
Eigenvalue	4.019	3.755	3.438	2.899	1.922	1.867
Variance Explained	15.456	14.441	13.222	11.152	7.392	7.180
Cumulative Variance	15.456	29.898	43.120	54.272	61.663	68.844
Alpha	.85	.90	.87	.84	.81	.83
Scale Mean Score	2.04	2.88	2.67	2.34	2.52	2.04

Table 2. Pearson Correlation Coefficients for Perceived Leisure Constraints, Frequency of Activity Participation, Perceived Physical Health, and Perceived Mental Health

	Age	Income	School year	Intrapersonal	Interpersonal	Structural	LP	PH	MH
Gender	-.054	***.187**	.091	-.002	.093	.060	-.041	-.018	***-.170**
Age		-.002	*****.464**	-.109	-.083	-.027	***.136**	***-.182**	.079
Income			-.165	.088	-.033	***-.140**	****.219**	-.041	.011
School year				-.049	.049	***.140**	-.057	.034	.057
Intrapersonal					*****.477**	*****.556**	***-.155**	-.125	****-.208**
Interpersonal						*****.627**	****-.250**	-.048	*****-.274**
Structural							***-.147**	-.038	***-.190**
Participation								.046	***.184**

* $p < .05$; ** $p < .01$; *** $p < .001$

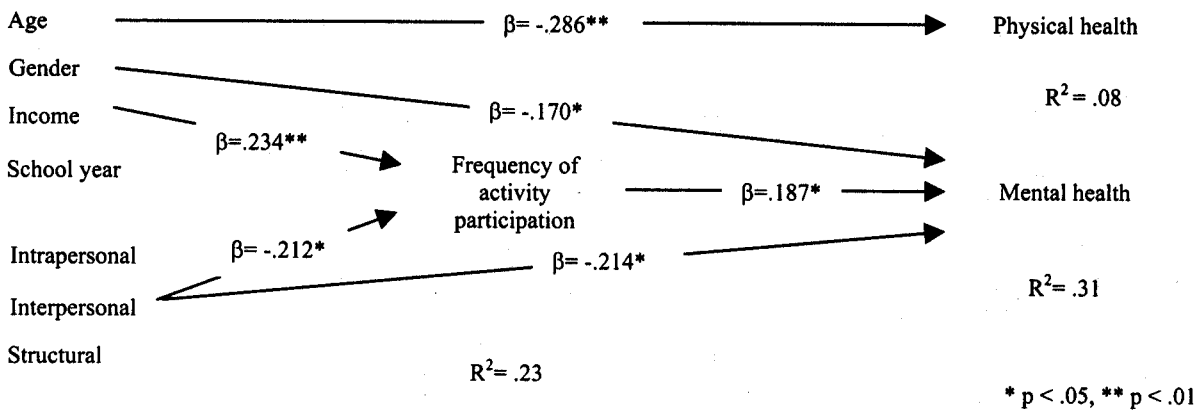

Figure 1. Results of a Path Analysis of the Leisure Constraints Model

Demographic variables, three constraint factors, and the frequency of activity participation were used to predict physical and mental health. The findings indicated that only age, among the socio-demographic variables, has a significant negative relationship with physical health (β = -.286, p = .003, Adj. R^2 = .08). As individuals age, they tend to rate themselves lower on physical health. No statistically significant relationship was found, however, for the relationship between perceived leisure constraints and physical health. Moreover, the results indicated that females tend to rank themselves lower on mental health scores (β = -.170, p = .041). No other socio-demographic variable influenced mental health. Examination of the beta weights indicated a positive relationship between frequency of activity participation and mental health status (β = .187, p = .018). Individuals with more frequency of activity participation also rated the highest on perceived mental health. There is a negative relationship between interpersonal constraints and mental health status (β =-.214, p = .045). If individuals perceived higher interpersonal constraints, they tended to rate themselves lower on mental health. With respect to mental health, the overall regression model explained 31.3% of the variance in the dependent variable.

Discussion

The initial results of this study suggested that there are indeed distinct factors that influence the structure of constraint domains. Psychological, accessibility, time, partner, facility, and safety factors can all serve as significant constraints on participation in outdoor recreational activities. Iso-Ahola and Mannell (1985) note that certain constraints may be stable throughout an individual's life span, over time, and in a variety of settings. The findings presented in this study suggest that some constraints have a negative influence on the levels of change of participation in leisure activities. According to Shaw and her colleagues (1991), however, higher levels of perceived constraints do not necessarily result in less leisure activity participation. Individual behavioral change is not easily determined by simple lack of availability in leisure activity. Furthermore, of the three types of leisure constraints examined, only interpersonal constraints have been found to effect participation levels. We assume that there may be some latent variable that moderates leisure participation. This may be a reflection of what is referred to in the literature about leisure constraint as a "negotiation strategy." We suggest, therefore, that future research should investigate what the moderating factors are that have a direct influence on the relationship between leisure constraints and leisure participation.

The results suggest that there are similarities between the perception of constraints among this Korean sample and those of participants in previous North American investigations, despite cultural differences with respect to activity type and recreational provision. Our study is important only with respect to the results of three constraints factors on outdoor recreational activity types. However, at least some of this may be due to the fact that many outdoor recreational activities are also luxurious leisure activities. The outdoor, recreational, activities used in this study, such as golf, skiing, hunting, windsurfing/water skiing are more likely to be money consuming activities. These activities may also be seasonal activities, to a greater or lesser extent. It might be difficult, for example, for university students to find people who have similar recreational interests and can afford to play and enjoy their leisure activity together. Further empirical research is recommended to expand this analysis, by including specific activity types according to a classification of leisure constraint categories.

As anticipated, the findings empirically support the perception that gender, interpersonal constraints, and frequency of activity participation were significant determinants of perceived mental health status. The findings also help to clarify how activity participation is influenced by peer absence. It was expected that university students would be less likely to participate in outdoor recreational activities in their leisure time, due to lack of money, support, and/or the availability of friends. Interpersonal constraints for Korean university students are considered to be major impediments to the perceived freedom to participate in new or continuing outdoor recreational activity.

Although the leisure constraints model followed in this study is based on theoretical assumptions, it has some empirical support; nevertheless, the results should be interpreted in light of the methodological limitations of the study. We used overall, outdoor recreational types to predict outdoor recreational activity participation. A more specific categorization of leisure activity types might have yielded different results. Future research on leisure constraints may need to take into consideration the key elements of a network of factors related to leisure constraints in leisure activity participation, which often involves constraint negotiation.

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EXPLORATION OF THE INFLUENCE OF SELF-EFFICACY ON RECREATION PARTICIPATION LEVELS OF INDIVIDUALS WITH VISUAL IMPAIRMENTS WHO USE DOG GUIDES

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Abstract: Self-efficacy and its relationship to outdoor recreation is only recently being explored. This paper is an attempt to identify the specific domain of leisure self-efficacy and to explore how it might be related to participation levels in outdoor recreation activities of individuals with visual impairments.

Introduction

Persons with disabilities have often been acknowledged as generally having lower participation rates in recreation activities. Part of the reason for this is the number of physical barriers one must overcome in order to participate. For example, a person in a wheelchair must negotiate curbs, poorly surfaced trails and narrow entrance gates. The Americans with Disabilities Act was developed to address many of these external challenges and, with its enforcement, is providing progress in breaking down visible barriers to leisure participation. However, there are still internal challenges that must be addressed if a person with a disability wishes to participate in recreation.

Internal challenges identified include lack of motivation, a perceived loss of control over one's environment and the perceived inability to participate. These barriers, because they are not visible to others, are often difficult to measure or modify, and, thus, are often difficult to address in the recreation profession in order to increase leisure participation levels of persons with disabilities. One of these internal components that may be strongly connected to participation is self-efficacy.

Self-efficacy is generally described as the belief of one's ability to accomplish something (Bandura, 1997; Zimmerman, Bandura & Martinez-Pons, 1992). The theory suggests that self-efficacy levels can "...influence behavioral choices, performance, and persistence" (Betz & Hackett, 1998, p. 1). Sherer and Maddux (1982) contend that "...expectations of self-efficacy are the most powerful determinants of behavioral change because self-efficacy expectancies determine the initial decision to perform a behavior, the effort expended, and persistence in the face of adversity."

There are three levels of specificity typically measured in self-efficacy: global efficacy; domain specific efficacy; and, task specific efficacy (Bandura, 1997). Research suggests that the best prediction of behavior occurs when the level of specificity used in measuring efficacy is matched with the level of behavior it is anticipated to predict. For example, high academic efficacy, a global level of efficacy, tends to predict more involvement in academic activities and higher levels of academic achievement (Pajares, 1996). In addition, it would be expected that high math efficacy, a domain specific efficacy, would predict high success in math related classes, which is a domain specific behavior, but not necessarily high success in specific math tasks such as multiplication which would be classified as task specific behaviors.

Current self-efficacy research is largely centered on the domains of academics, work, and, more recently, sports (Pajares, 2000). However, little research is available regarding self-efficacy in leisure and no specific scale has yet been developed to measure leisure self-efficacy. Examining self-efficacy in leisure could provide additional information regarding why individuals choose to participate or not to participate in leisure programs. In addition, a leisure self-efficacy scale could be used as a tool for predicting the success or failure of leisure programs relative to specific populations.

The purpose of this study was to examine how leisure self-efficacy relates to levels of recreation participation, in particular, for people with visual impairments. People who used dog guides were chosen specifically as it was anticipated they would be more likely to participate in activities (Hart, Hart & Bergin, 1987; Steffens & Bergler, 1998).

The questions posed for research in this study were:

R.Q. 1: What is the factor structure of the proposed leisure self-efficacy scale?

R.Q. 2: How strongly does a general leisure self-efficacy scale relate to participation in specific leisure activities?

Methods

Leader Dogs for the Blind (LDFB) in Rochester, Michigan was contacted and agreed to distribute a self-administered survey to their active graduates. These individuals are at least 18 years old, have visual impairments and use dogs as guides. LDFB indicated that the response rate for this population is typically 20-30%, therefore, rather than select a sample, the survey was sent to all individuals in the population. In addition, because LDFB required their respondents have complete anonymity, reminder postcards could not be sent to improve the response rate. So, in order to attempt to increase response rate, we decided to implement three additional methods of responding to our written survey. First, participants were given a toll-free phone number to call if they preferred to have the survey read to them via telephone. In addition, respondents could

call the toll-free number to request the questionnaire in Braille. Finally, we printed the survey in 14-point type to facilitate completion by individuals with low vision. Three respondents contacted us to have the survey read over the phone, however, there were no requests for the survey in Braille.

All individuals (N=234) who were active graduates of the Leader Dogs for the Blind School were sent an introductory letter, self-administered survey and self-addressed stamped envelopes. The response rate of 26% (n=65), although within the expected response range, raises concerns about non-response bias.

Data were collected regarding levels of global self-efficacy using items from Bandura's (1997) General Self-Efficacy Scale. Leisure self-efficacy was measured using items from Bandura's scale modified with the phrase 'free-time'. Respondents were asked to indicate to what extent they agreed with each statement on a five-point scale from strongly agree to strongly disagree. In addition, they were asked to indicate at what level they participated in 31 activities on a five-point Likert-type scale with 1=not at all and 5=very often. The activities were grouped into the following five categories: physical activities; arts & entertainment activities; hobbies; social activities; and, home-based entertainment activities.

Results

General demographics of the population indicate this is a highly educated group with 80% having at least some college or more. It is comprised of 60% females with 52% of all respondents falling between 40 and 59 years of age. In addition, 51% of respondents are Braille users. This relatively high number of Braille users suggests a sample that is highly educated relative to the population of persons with visual impairments in the United States (Kinder, 1999).

Before examining how self-efficacy in leisure related to activity participation, the factor structure of the leisure self-efficacy subscale was established. First, a reliability analysis was conducted on the leisure efficacy items as posited. Results indicated a moderate reliability of alpha=.77. In addition, inter-item correlations were between .2 and .4, which suggested a relationship between the items without duplication of information.

However, because this was an exploratory study, we also ran a principle axis factor analysis to examine the interrelationship of all of the items including those used to measure global efficacy. Results revealed several items that were posited to measure efficacy at a global level actually loaded heavily on the domain of leisure. The reliability of the scale increased to alpha = .80.

Upon review of the questionnaire, it appears the loading of the global self-efficacy items with the leisure self-efficacy items may be a result of priming. Participants had already answered two pages of leisure participation related questions before beginning to answer the self-efficacy related questions. Therefore, they may have considered their answers within the framework of leisure. However, because there is not a clear understanding of these unexpected results, and because of the relatively small change in reliability, the originally posited scale was used in further analysis.

Table 1. Factor Analysis Results of Global and Leisure Self-efficacy Subscale Items

Survey Item	Factor Loading from Principle Axis Factor Analysis with Varimax Rotation
When I have something unpleasant to do, I stick to it until I finish it.	.747
If I can't do a job the first time, I keep trying until I can.	.636
I give up on projects or activities in my free time before completing them.[1,3]	.636
When unexpected problems occur during my free time, I don't handle them well.[1,3]	.630
When I make plans regarding the use of my free time, I am certain I can make them work.[3]	.605
When I decide to do something during my free time, I do it right away.[3]	.583
In deciding how to use my free time, I avoid facing difficulties.[1,3]	.541
I am a self-reliant person.	.538
Failure just makes me try harder.	.526
When I set important goals for myself regarding the use of my free time I rarely achieve them.[1,3]	[2]
If a leisure or recreation activity looks too complicated, I will not even bother to try it.[1,3]	[2]
When trying to learn a new leisure or recreation activity, I soon give up if I am not initially successful.[1,3]	[2]
I feel insecure about my ability to do leisure or recreation activities in my free time.[1,3]	[2]

[1]Items were reverse coded in the final analysis.
[2]Item loaded at less than a .4 level in the Principle Axis Factor Analysis.
[3] Items were originally posited to comprise the leisure self-efficacy subscale and were used in the correlation analyses.

The leisure efficacy subscale was then examined for the potential to predict participation in leisure activities. Leisure activity participation was measured using two different indices of participation. Recreation Activity Index 1 (RAI 1) was developed by calculating the mean of the participation frequency for each participant in each group of activities. Recreation Activity Index 2 (RAI 2) was developed by dummy coding each recreation activity with 1=participated and 0=did not participate. The mean of the number of activities in which they participated was then used as the index value. Each participation index was then correlated with the leisure self-efficacy subscale.

The results of the correlation analyses indicated the leisure scale had a minimal relationship with both of the indices used to measure leisure participation. When the RAI 1 was correlated with the leisure efficacy index, results indicated a significant relationship at the .05 level with the physical activity index of Pearson Correlation Coefficient = .266 and the arts & entertainment index Pearson Correlation Coefficient = .337. Correlation of the RAI 2 with the leisure self-efficacy subscale revealed significant correlations with the same two groups at similar levels. There were no other significant correlations. Outdoor recreation, in particular, was not significantly correlated to the leisure self-efficacy subscale regardless of index used.

Discussion

Efficacy is generally divided into three levels: global, contextual or domain specific, and situational or activity specific. Motivational literature suggests, "...the consequences are of the same level of generality as the level of generality of the motivation that engendered them" (Vallerand, 1997, p. 276). Self-efficacy literature also suggests that the level of efficacy measured should be at the same level as the activity that is measured. Bandura (1997) notes "...the 'one measure fits all' approach usually has limited explanatory and predictive value because most of the items in an all-purpose test may have little or no relevance to the domain of functioning that is being studied" (p. 1). In other words, academic efficacy, which is domain specific, has a stronger relationship to success and participation in academics, in general, whereas math efficacy, which is task or item specific, is a better predictor of success and participation in math rather than of success and participation in other academic areas.

In this study, leisure efficacy was hypothesized to predict levels of leisure participation. It may appear that this study does not support the theory that increased levels of efficacy can predict levels of participation within domain specific activity. However, further examination of the questions used to determine self-efficacy suggests that, perhaps, leisure self-efficacy as a sub-domain was not measured adequately. Using an existing global self-efficacy scale modified through the addition of one phrase, i.e., free time, may not be an adequate measure of free time efficacy. Although this method has been successful in previous research (Sherer & Maddux, 1982) it may be a more accurate measure if we completely deconstruct and rewrite the statements intended to measure leisure self-efficacy.

In addition, it may be that the leisure self-efficacy subscale is not a good predictor of participation in specific activities. The specific activity questions may be measuring leisure participation at a situational level whereas the leisure self-efficacy scale may be measuring self-efficacy at a contextual level.

The most important component of this study may be its exploratory nature of the use of domain specific self-efficacy scales and their reliability and validity. As self-efficacy theory suggests, once a reliable and valid scale is established, it should also be a predictor of levels of achievement within domains. A leisure self-efficacy scale, as well as a recreation participation efficacy scale, may be a valuable tool to use in predicting the effectiveness of leisure or recreation programs. Future research in this area would be likely to focus on leisure and/or recreation efficacy scale development. From that scale development, further studies could then focus on the ability of the scale to predict leisure and/or recreation participation.

Finally, results from this study are subject to several limitations. Clearly, response rate bias is relatively high due to the low response rate. In addition, the population studied in this paper is unique. Individuals with visual impairments who use dog guides in Michigan account for less than 0.5% of the entire population of persons with visual impairments in the United States. The fact that these individuals use dogs and have a disability may result in attribution of a different meaning to self-efficacy and to leisure. Certainly, some constraints to leisure participation are unique due to the fact that these participants lack vision. Because of these limitations, it is important to use caution in interpretation and generalization of these study results.

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Urban Recreation & Development Issues

AN INTEGRATIVE CONCEPT FOR VISITOR MONITORING IN A HEAVILY USED CONSERVATION AREA IN THE VICINITY OF A LARGE CITY: THE DANUBE FLOODPLAINS NATIONAL PARK, VIENNA

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Abstract: The Danube Floodplains National Park, Vienna, Austria is used predominantly by the Viennese population for daily recreation purposes. Different methods were applied for the monitoring of visitor activities in the National Park (long-term video monitoring, short-term visitor observation, interviews and route registration). The results show that only a combination of monitoring and survey data obtained by various methods allows a thorough analysis of visitor activities as a basis for the ecologically and economically sustainable management of recreation and conservation areas.

Introduction

Wildland recreation areas in close proximity to large conurbations present managers and researchers with a variety of challenging problems, due to the high number of visitors and the multifaceted visitor structure. 'Often times the activities and behaviors engaged in by urban visitors do not fit traditional conceptions of wildland recreation' (Heywood, 1993). Therefore, successful management requires an extensive recording of the uses visitors make of these areas.

The Danube Floodplains National Park has a rather unique position among the National Parks of Europe. The Park is situated in the east of Vienna, the capital city of Austria, with a population of 1.7 million. A large percentage of the national park's area, the so-called Lobau, actually lies within the city boundaries of Vienna (XXIIth district) and within the boundaries of Groß-Enzersdorf, a small municipality in Lower Austria. Settlements and areas of intensive agriculture surround the park (Figure 1).

For decades, the Lobau with an area of 24 km^2 (9.3 square miles) has been mainly used by the Viennese and the residents of Groß-Enzersdorf as a regional recreation area,

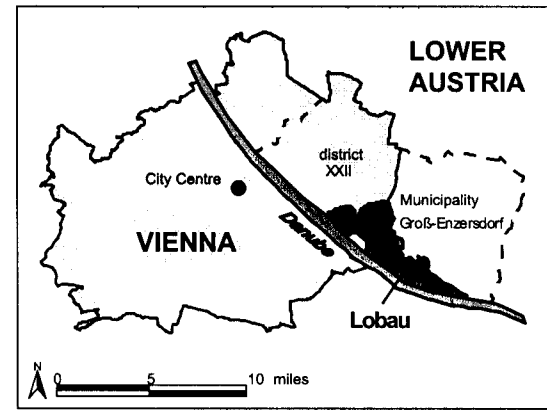

Figure 1. Study area: Lobau, the Viennese Part of the Danube Floodplains National Park (Hinterberger, 2000, modified)

as it serves as a residential environment. In 1996, the Danube Floodplains were declared a National Park, and in 1997 they received international recognition, IUCN category II. Therefore, the protection of the floodplains gained in importance compared to the use as recreation area, which for decades had been the major focus.

Park management now has the task to fulfil both the demands posed by intensive daily recreational use and by the need to protect the floodplains' forested landscape. To deal effectively with the high number of visitors, management requires more detailed information about user behavior. The visitor monitoring project of the Institute for Landscape Architecture and Landscape Management at the University of Agricultural Sciences, Vienna (Arnberger et al., 2000a) contributes significantly to this knowledge gap. This study was commissioned by the Department of Forestry of the City Council of Vienna.

Methods

As illustrated in Figure 2, the following methods for visitor monitoring were used:

- *Permanent time-lapse video recording:*
  Video-cameras were installed at several entrance points to monitor recreational activities (see Leatherberry & Lime, 1981) year round, from dawn to dusk. For the analysis, only 15 minutes of observations per hour were taken into account, but this had no negative impact upon the significance of the results (Brandenburg, Muhar & Zemann, 1996; Muhar, Zemann & Lengauer, 1995). Given the type of video system installed, it is not possible to identify individual persons, so anonymity can be guaranteed.

- *Interviews and personal observation:*
  At the 12 main entrance points into the park visitors were counted and interviewed about their motives, activities, expectations etc. on four days; the counting and the interviews took place on a Thursday and the

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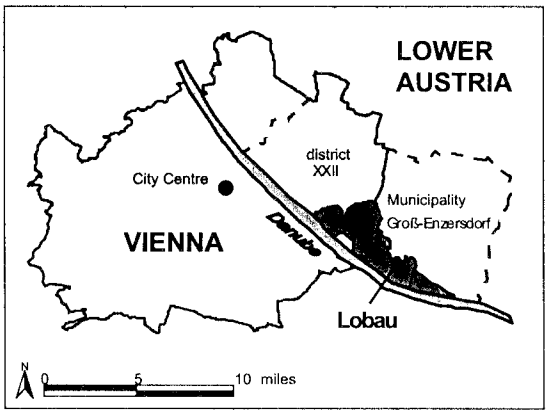

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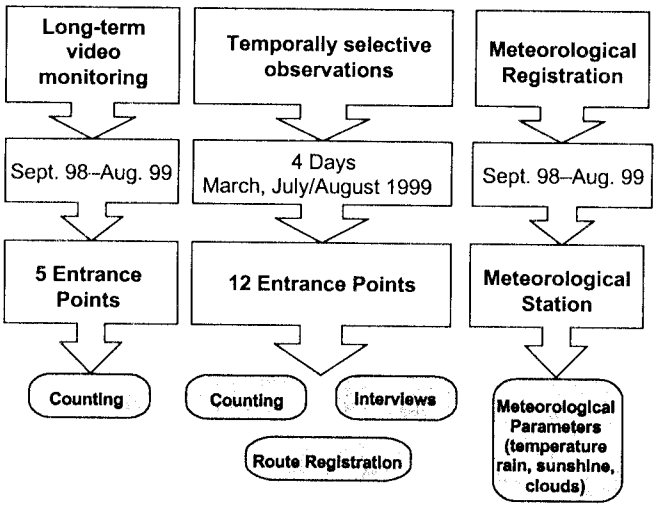

Figure 2. Methods of Data Gathering

immediately following Sunday, once in spring and once in summer. The survey was conducted on days of fine weather, to be able to collect as many data as possible. The total sample size for this study was 780. This temporally selective counting can be combined with video data for extrapolating to the total number of visitors per year.

- *Analysis of the routes taken on the basis of the results of the survey (frequency maps):*
  As part of the survey, visitors were asked to mark the route through the Lobau which they took or planned to take in a simple map. By linking the data from the interviews with the help of an Access database, an analysis by topic was possible and the respective routes could be made visible via GIS (ArcView) (see Hinterberger, 2000; Arnberger et al., 2000b).

Interviews

More than 90 percent of the visitors interviewed reside in Vienna. A high frequency of visits could be observed; more than 60 percent of interviewees visit the Lobau at least once a week. The Lobau can therefore be called the "green living room" for a large number of Vienna's inhabitants. An analysis of the visitor surveys lead to the differentiation between three types of visitors, characterized primarily by their residential address, the frequency of their visits and their motivation for visiting the Lobau.

The visitor types are:

- Regular recreational visitors from a residential environment: home less than two kilometers away from entry point, very high frequency of visits (at least once a week), short length of stay in the park (up to 2 hours); the motive for the visit is the proximity to the Lobau and the opportunities offered for sporting and recreational activities (e.g. jogging).
- Occasional recreational visitors from other parts of the city and Lower Austria: home more than two kilometers away from entry point, go there frequently (at least once a month), but stay for more than 2 hours and are motivated to visit the landscape.
- National park visitors: home further away from the Lobau, low frequency of visits, the motive for the visit is the wish to see the National Park. This type accounts only for 2 percent of the total number of visitors.

Analysis of routes

The frequency maps developed on the basis of the survey present the distribution of visitors within the observed area by type of user, catchment area, park entrances, length of stay, frequency of visits, days of the week, seasons etc. as basis for further interpretation. In addition, the path length could be compared by kind of use, season and other variables. Given the information provided in the interviews about the home of the visitors, it was possible to divide the catchment area into three zones (Figure 3). When one compares the routes chosen by visitors from the three zones, it becomes obvious that people coming from the residential area adjacent to the Lobau (zone 1, up to about 2 kilometers away from the Lobau) tended to stay in those parts of the Lobau close to the residential area.

Counting

Long-term video monitoring lead to the following information:

- Chronological distribution of the visitors: number of visitors over the entire year, by month or by season; daily visits, daily visits by season, peak days, minimum and average number of visitors per day, total number of hours visitors spend in the park.

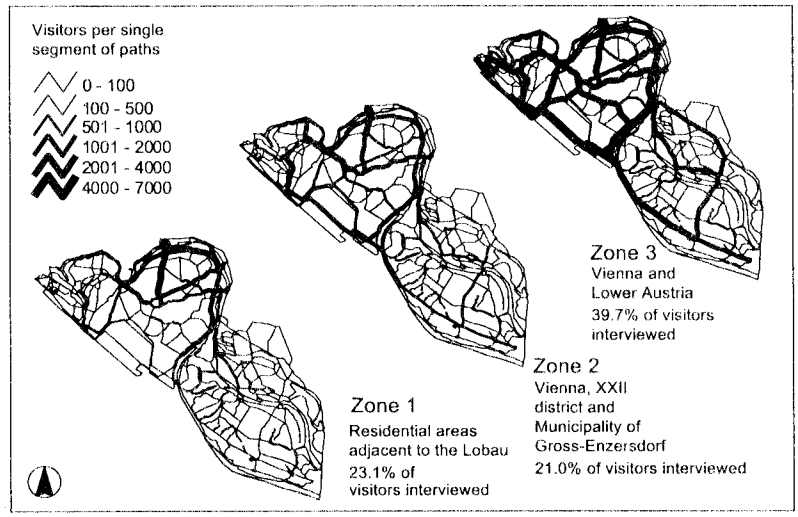

Figure 3. Routes Depending on Catchment Area (Hinterberger, 2000, modified)

- Spatial distribution of visitors: number of visitors at various entrance points, choice of direction at the intersection of paths etc.
- Linking of chronological and spatial data: number of visitors at a certain entrance point at a certain time, average duration of visits.
- Quantification of user groups: cyclists and their distribution in space and time etc.
- Recording and quantification of behavior not wanted by the management: dogs not kept on leash etc.
- Correlation of visitor numbers with meteorological data, such as temperature or rain.
- Prognostic models: the data provide a basis for the development of prognostic models to predict visitor loads.

The Lobau is used by about 600,000 people per year. The main users of the Lobau enjoy biking and hiking, while a minority is jogging (3%) and swimming (1%). The main period of visitation is between March and October with highest frequencies being observed in May and on Sunday afternoons, when all types of visitors can be found in the Lobau (Figure 4).

The main visiting period for bikers is the summer, for pedestrians it is spring (Figure 5). Joggers do not peak as drastically during the summer, but larger number of visits on their part can be observed during the shoulder seasons (March, April and September, October).

The pattern of visitation on working days differs considerably from the situation on weekends (Figure 6). On working days, the overall number of visitors is obviously lower, and grows steadily to a small peak in the early afternoon, while over the weekend and on public holidays a significant peak can be observed in the afternoon. On average, at 2 p.m. on weekends, four times as many visitors can be observed per hour than at the same time on a working day. The number of visitors leaving the

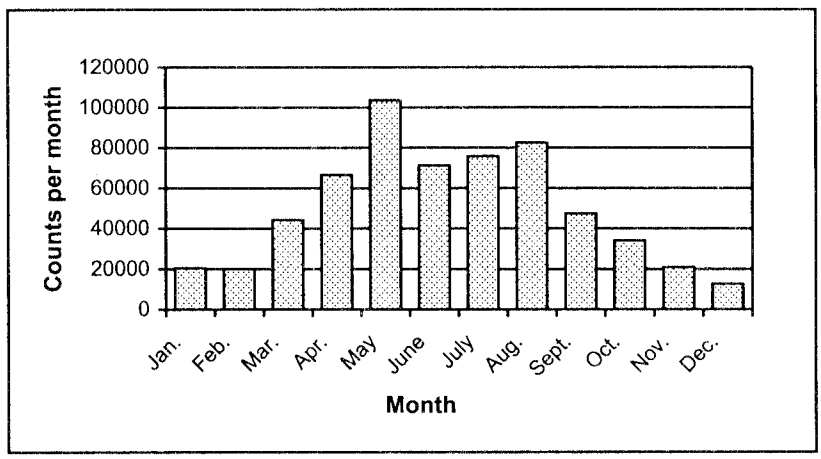

Figure 4. Visits per Month over the Year

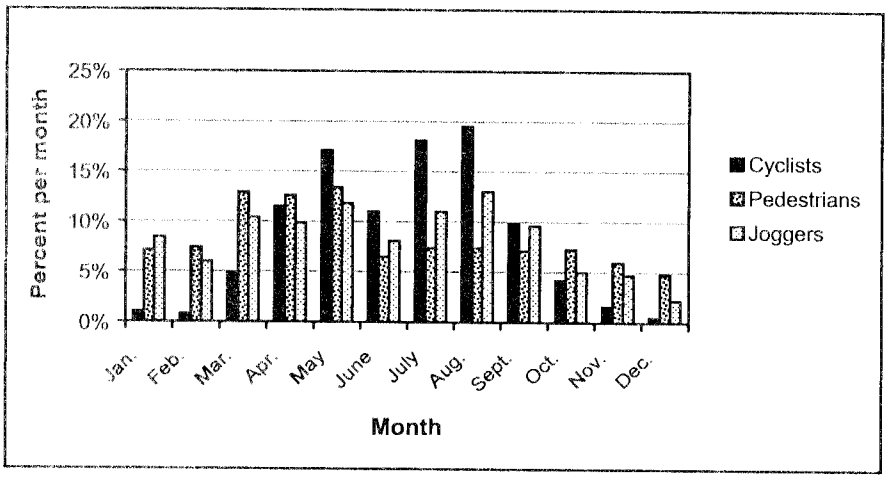

Figure 5. Relative Seasonal Distribution of User Groups

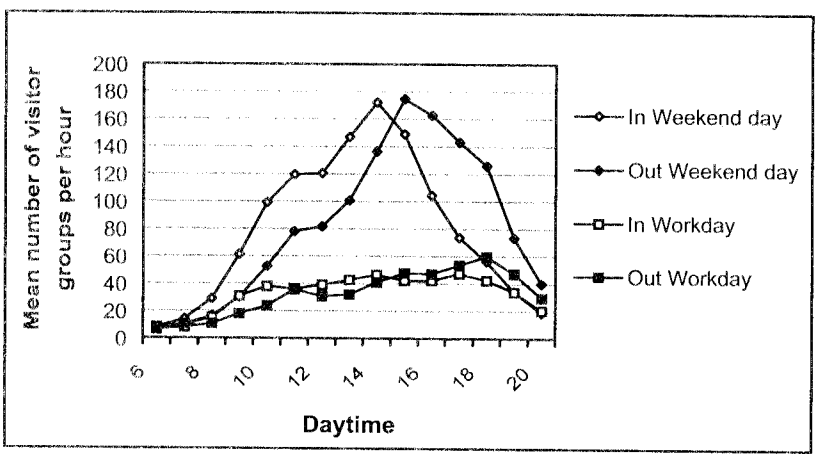

Figure 6. Hourly Visitor Rates Depending on Day of the Week over the Year

Lobau is roughly the same as the number of people entering the Lobau, but there is a time delay by about one to two hours. On working days, a comparatively high number of people enter the Lobau late in the afternoon or early in the evening, while over the weekend the number of visitors entering the Lobau already starts to decrease significantly from 2 p.m. onward.

Model to Predict Visitor Loads

The second focus of this project was the investigation and modelling of relationships between the number of visitors and external factors such as weather, season and day of the week (Brandenburg, 2001). Reliable models can be calibrated for the total number of visitors per day as well as for specific user groups with high numbers (i.e. pedestrians and cyclists). A Univariate Analysis of Variance was used. The model allows the prediction of visitor loads for a specific day (Figure 7).

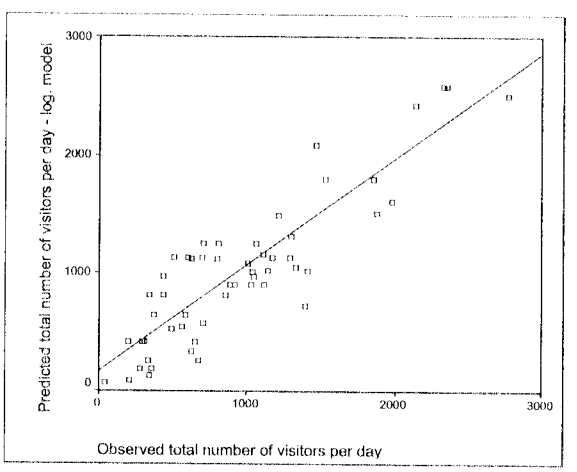

Figure 7. Model for the total number of visitors per day (adjusted $R^2 = .834$)

The day of the week has the greatest influence upon the total number of visitors as well as for user groups (Table 1). Temperature as a meteorological feature appears in the models indirectly through the scale indices of thermal comfort and the development of the temperature during the day. The Physiological Equivalent Temperature (PET) has a major impact upon the number of visitors per day, in particular on cyclists and pedestrians. 'PET is defined as the air temperature at which in a typical indoor setting (without wind and solar radiation) the heat budget of the human body is balanced with the same core and skin temperature as under the complex outdoor conditions to be assessed' (Höppe, 1999). The usage patterns of joggers and dog owners were more complex to model, as they apparently are less dependent on weather related factors. The development of the weather is integrated into the model via the development of the temperature and cloud cover in the preceding seven days. However, the overall effect of these factors is small.

Use of the Visitor Analysis Data for the Management of the Park

The results of the visitor analysis can be used for the planning and management in and around the national park (Table 2). For example:

- Areas of origin, particularly the residential areas close to the national park: improvements to residential areas.
- Wildland/urban interface: design and sizing of park entrances.
- National park: ecological and visitor management in the national park.

Conclusions and Outlook

The quality of data collected in short-term monitoring campaigns is heavily affected by statistical variations. Thus, long-term monitoring can be a very important complement to short-term in-depth visitor observation and interviews. (See Figure 8.) Due to the density and structure

Table 1. Explanatory Value of the Total Number of Visitors per Day and the User Groups Cyclists, Pedestrians, Joggers and Dog Owners (Brandenburg, 2001)

Extent of interference	Total number of visitors	Cyclists	Pedestrians	Joggers	Dog owners
Workday, Weekend and holiday	high	high	high	small	moderate
Rain	moderate	moderate	small	extant	extant
PET	high	high	moderate		extant
Clouds	moderate	moderate	small		small
Interaction between weekday and PET	moderate		small		extant
Cloud coverage of the last 7 days			very small	extant	extant
Temperature of the last 7 days		moderate	very small		
Value of model	adj. R^2=.834	adj. R^2=.844	adj. R^2=.744	adj. R^2=.291	adj. R^2=.440

Table 2. Application of Visitor Analysis Data

Areas of origin, particularly residential areas close to the national park	Wildland/urban interface (park entrances)	National park
• Improvements in the residential areas close to the Lobau (green connections, parks) • Better co-ordination of time tables of public transport to the National park Connection to other foot paths and cycle lanes • Contribution to development plans for the area close to the National park • Contribution to marketing strategies to promote the National parks • Signposting of the paths in the National park on the basis of the interview results	• Location, dimension and design of new entrance and information points (size of visitor rooms, number of parking spaces, management of the parking lot, architectural design) • Schedules for the personnel at information points (when, where, for how long) • Type of information required and best way to convey it depending on the kind of visitors at various entrance points	• Refined distribution of zones: marking of rest or recreational areas in connection with a certain guidance of visitors in time and space • Kind of facilities needed in recreational areas • Paths: making some more attractive and giving up others, path design (for example, choice of surface) depending on kind of use • Schedules for the personnel of the park who look after visitors, organize walks etc. (in time and space) and the management of resources • Targeted measures to address observed, undesirable behavior (for example, dogs not kept on leashes) • Basic data for further research projects

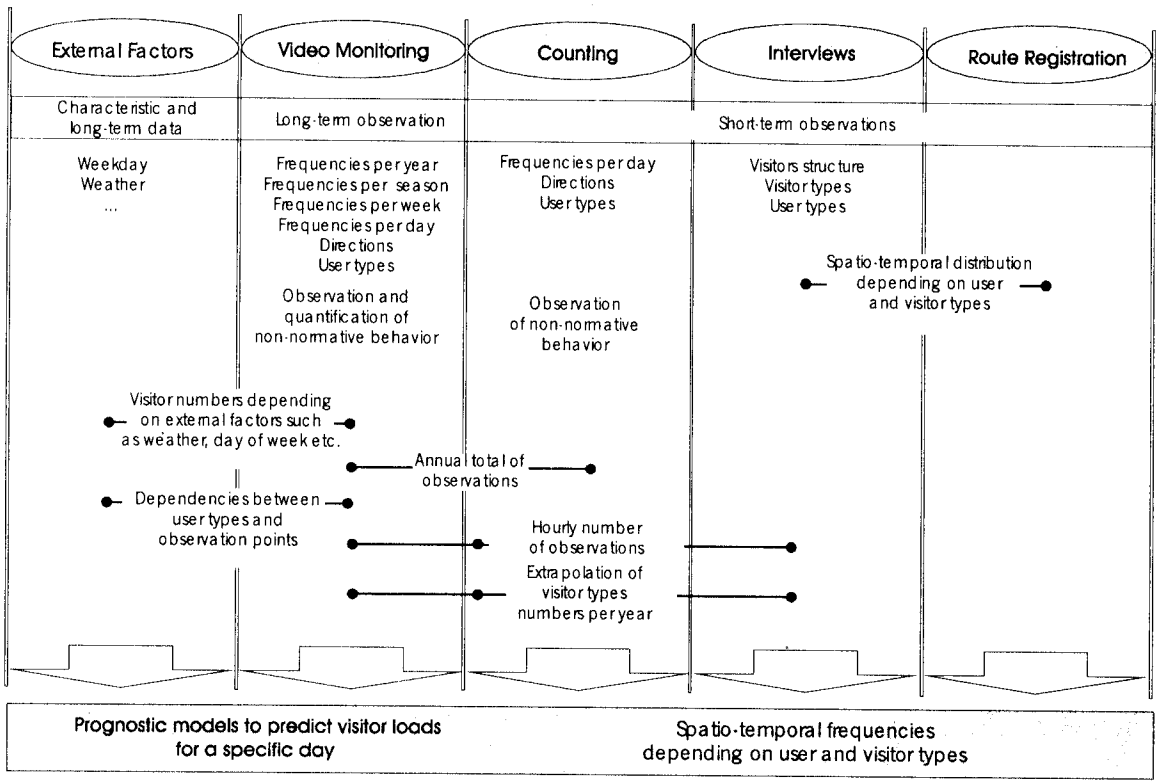

Figure 8: Methods for an Integrative Concept for Visitor Monitoring – Overview (Brandenburg, 2001, modified)

of the data collected, long-term monitoring offers remarkable advantages for a more in-depth evaluation. However, the overall expenses are rather high. However, when considering the proportional costs per registration day and monitoring point, long-term video monitoring fares very well because of the relatively low installation costs for each unit.

Consequently, this research project lead to the result that only the combination of monitoring and survey data gained by different methods allows a thorough analysis of visitor activities as a basis for the ecologically and economically sustainable management of recreation and conservation areas. Only on this basis, a precise description of the use people make of a particular recreation area can be provided.

Planned are an improvement of computer simulation modelling and research on the social carrying capacity as well as on crowding issues (Shelby & Heberlein, 1986; Manning, 1999) based on types of visitors and in combination with long-term video data.

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LINKAGES IN THE USE OF RECREATION ENVIRONMENTS ACROSS THE URBAN TO EX-URBAN SPECTRUM BY URBAN RESIDENTS

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Abstract: A study of recreation behavior of residents of Cook County, Illinois was conducted in early 1999. Respondents were contacted via telephone and surveyed about their awareness and use of outdoor recreation sites in and around Chicago and as far away as the Shawnee National Forest in Southern Illinois. The sample was selected using random digit dialing and a quota for each of three specific groups: Non-Hispanic White Americans (n=618), African Americans (n=647), and Hispanic Americans (n=346). Responses to questions about visitation to 20 recreation sites within the last 12 months were factor analyzed revealing 5 site factors. The factors varied in the type of experiences provided, level of naturalness, and proximity to Chicago. In other analyses we examined awareness and use of recreation sites by race/ethnicity, place of residence, and other demographic variables. Results not only elucidate participation patterns but also have important implications for site managers who may want to coordinate their outreach efforts with other sites to encourage greater awareness of recreation opportunities, higher levels of use, and greater interaction with natural resource management and use.

Introduction

Urban residents are playing an increasingly significant role in the development of management programs and policies for natural resources. This is prompting those who develop policies and programs for natural resources to work to increase the interactions that urban residents have with natural resources and their management and use. Many natural resource planners and managers believe that nature based recreation experiences in urban areas pave the way for urban residents to learn about, care about, and even become an advocate for nature in urban and ex-urban areas. In light of the purported synergism, regional resource stewardship initiatives, such as Chicago Wilderness (Ross, 1997), have worked to link the programs of land management, outdoor recreation, education, and research in building support for regional biodiversity. In this way, they can repeat a consistent message across venues thus reinforcing knowledge and strengthening support for nature and natural places. The success of these efforts depends in part on understanding what sets of sites are used by the same people. Knowing this will help in honing consistent messages across sites. One day, recreation site managers may be able to employ the tools of niche marketing used by companies such as Amazon.com, the internet bookseller, where recommendations for new books are made based on knowledge of past book purchases.

Cook County, in northeastern Illinois, is an ideal place to examine recreation site linkages and group preferences for site types because it is racially/ethnically diverse and offers a wide variety of recreation opportunities. Cook County occupies the inner core of the 13 - county Chicago Metropolitan area, and with a population of 5.5 million people, is home to almost 60% of the metro area residents. Recreation sites available in Cook County include city parks, county forest preserves, state and federal parks, zoos, museums, arboreta, a botanic garden, and conservatories. A national forest, the Shawnee, is located in southern Illinois. For this study the Chicago-area sites were chosen as representative of the diverse range of natural resource - related opportunities available in and beyond the Chicago area that might be considered for "urban outreach" efforts. The Shawnee National Forest was included because it is the only national forest in the state.

Our objectives were to identify the patterns of use across the twenty recreation sites and assess how site use varied by racial/ethnic group, place of residence, and a variety of other demographic characteristics. Results of this study can help improve outreach to urban residents as well as guide policies aimed at providing information about outdoor recreation, environmental education, and resource management at urban sites.

The Sample

We sampled Non-Hispanic Whites, African Americans, and Hispanic Americans from the population of Cook County, Illinois using random digit dialing and a quota for each group. Our sample targets were 600 Non-Hispanic Whites, 600 African Americans, and 300 Hispanic Americans. Our final sample included 618 Non-Hispanic Whites, 647 African Americans, and 346 Hispanic Americans. Only heads of households were interviewed, alternating between males and females. Spanish speaking interviewers were on hand, if needed, to conduct interviews with Hispanic respondents.

The Survey Instrument

The survey instrument was patterned closely after the Illinois SCORP (Statewide Comprehensive Outdoor Recreation Participation) Survey that is conducted every few years by the Illinois Department of Natural Resources. The survey included questions about participation in different activities, preferences for site attributes, preferences for levels of naturalness, and visits to recreation areas outside Illinois (Dwyer & Barro, 2001). The analysis described in this paper is based primarily on responses to questions about visits to 20 different recreation sites (19 located in or near the Chicago Metropolitan area and the Shawnee National Forest in Southern Illinois) (Figure 1). Basic demographic information gathered included race/ethnicity, zip code, age, gender, income level, and number of people in the household.

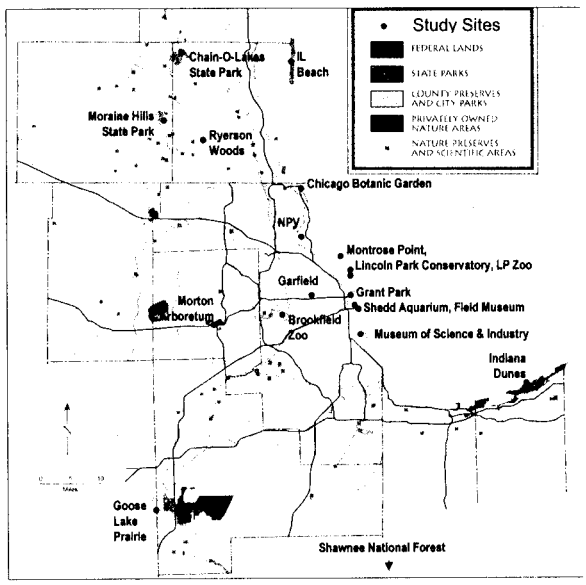

Figure 1. Chicago Area Study Sites

Analysis

We looked at visitation (visited or not visited in the previous 12 months) to twenty recreation sites to begin to examine recreation site use patterns of Cook County residents. While we over-sampled African Americans and Hispanic Americans in the data collection, the analyses presented here are based on observations that were weighted to reflect the population of Cook County, Illinois. We used factor analysis with varimax rotation to identify what sites showed similar use patterns. In other analyses, we examined use of site types by racial/ethnic group, place of residence, gender, age, income, and education.

Results of Factor Analysis

Five factors, explaining 48 percent of the variance, emerged from the analysis of visitation data when the entire sample was analyzed (Table 1). The pattern of site clustering revealed the following: (1) sites in close proximity to each other tended to load on the same factor (e.g., groupings of urban sites, suburban sites, and ex-urban

Table 1. Factor Analysis of Visitation to Sites During the Past 12 Months, Entire Study Sample

	Factors				
Factor label: Sites	I.	II.	III.	IV.	V.
Downtown Sites					
Museum of Science and Industry	**.782**	.128	.073	-.021	-.052
Field Museum of Natural History	**.762**	.159	.059	.024	.026
Shedd Aquarium	**.714**	.146	.082	.006	.090
Brookfield Zoo	**.650**	.049	.135	.096	.026
Indiana Dunes National Lakeshore	**.468**	.080	.356	.157	-.152
Grant Park	**.458**	.390	.012	.023	.031
Near-North Side					
Lincoln Park Conservatory	.247	**.724**	.039	-.062	.034
Montrose Point (Lincoln Park)	.022	**.594**	.089	.049	.058
Lincoln Park Zoo	.413	**.577**	-.042	-.035	-.100
North Park Village Nature Center	-.086	**.517**	.217	.202	-.024
Garfield Park Conservatory	.252	**.448**	.018	.045	-.013
Far-North Sites					
Ryerson woods	-.021	.176	**.691**	-.160	.075
Illinois Beach State Park	.213	.117	**.632**	.109	-.078
Chain-O-Lakes State Park	.157	-.036	**.579**	.144	.191
Moraine Hills State Park	.035	.035	**.525**	.405	-.147
Ex-Urban Areas					
Shawnee National Forest	.070	-.037	.057	**.730**	.100
Goose Lake Prairie	.034	.179	.088	**.726**	-.031
Arboretum/Botanic Garden Sites					
Morton Arboretum	.162	.195	.184	.167	**.672**
Chicago Botanic Garden	.319	.370	.241	.109	**.403**
Midewin National Tallgrass Prairie	.112	.210	.174	.139	**-.579**
Eigenvalue	4.52	1.75	1.29	1.06	1.01
Percent variance	22.6	8.7	6.4	5.3	5.1

sites), and (2) sites that provided similar experiences (e.g., an arboretum and a botanic garden) or had similar levels of naturalness loaded on the same factor. The five factors were subsequently labeled: I. Downtown Sites, II. Near-North Sites, III. Far North Sites, IV. Ex-Urban Sites, and V. Arboretum/Botanic Garden Sites and are described below.

Downtown Sites (I) -- This factor explained the largest portion of the variance. Six sites loaded strongly on this factor. Three of the six sites were museum-type sites located in downtown Chicago: The Museum of Science and Industry, the Field Museum of Natural History, and the Shedd Aquarium. Grant Park is a large lakefront park immediately adjacent to the Field Museum. It is also the site of many festivals. Brookfield Zoo, located 15 miles west of downtown Chicago, fits with the museum-type attractions (i.e., a museum with live animals) that make up a significant portion of the factor. However, Lincoln Park Zoo, which is located closer to downtown than Brookfield Zoo, loaded more strongly on the second factor (Near-North Sites). Indiana Dunes National Lakeshore, located approximately 47 miles southeast of downtown Chicago was the final site to load on this factor.

Near-North Sites (II) -- This factor was composed of five sites including three in Chicago's Lincoln Park: Lincoln Park Zoo and Lincoln Park Conservatory (located just north of downtown Chicago), plus Montrose Point which is located just north of the zoo and conservatory on Lake Michigan. Also included in this factor is North Park Village Nature Center, which is located 12 miles northwest of the city center, and Garfield Park Conservatory, which is west of downtown Chicago and is similar to the Lincoln Park Conservatory.

Far-North Sites (III) -- This factor includes a county forest preserve site (Ryerson Woods), and three Illinois state parks (Illinois Beach State Park, Chain-O-Lakes State Park, and Moraine Hills State Park) -- all located north or northwest of Chicago. Ryerson Woods is in suburban Lake County, while the state parks are in predominately rural areas of Lake and McHenry Counties.

Ex-Urban Areas (IV) -- This factor includes the Shawnee National Forest and Goose Lake Prairie State Park. The Shawnee is located 342 miles south of Chicago and the Goose Lake Prairie 57 miles southwest of Chicago. While the Shawnee is far more extensive than Goose Lake Prairie State Park, both offer natural environments and substantial opportunities to observe wildlife and to fish and hunt.

Arboretum/Botanic Garden Sites (V) – This factor is composed of two sites: The Chicago Botanic Garden and The Morton Arboretum, both of which offer unique opportunities to experience a wide variety of native and non-native plants as individuals and in landscapes. The Chicago Botanic Garden is 22 miles north of the center of Chicago and Morton Arboretum some 27 miles southwest. Midewin National Tallgrass Prairie had a strong negative loading on this factor that was not easily explained. Given low participation data for that site (Table 2), it was dropped from the analysis.

Table 2. Percent of Respondents in Each Racial/Ethnic Group Who Reported Visiting Study Sites in the Previous 12 Months

Sites	Anglo American	African American	Hispanic American
Downtown Sites			
*Museum of Science and Industry	52	59	45
Field Museum of Natural History	48	51	46
Shedd Aquarium	45	51	50
Brookfield Zoo	51	52	50
Indiana Dunes National Lakeshore	26	24	21
*Grant Park	62	72	59
Near-North Side			
Lincoln Park Conservatory	24	25	30
Montrose Point (Lincoln Park)	19	14	20
*Lincoln Park Zoo	44	53	59
North Park Village Nature Center	6	5	5
*Garfield Park Conservatory	10	33	10
Far-North Sites			
Ryerson woods	4	3	1
Illinois Beach State Park	45	22	18
*Chain-O-Lakes State Park	24	5	6
Moraine Hills State Park	5	3	3
Ex-Urban Areas			
Shawnee National Forest	6	4	3
Goose Lake Prairie	4	3	3
Arboretum/Botanic Garden Sites			
*Morton Arboretum	22	6	8
Chicago Botanic Garden	30	24	25
Midewin National Tallgrass Prairie	2	4	3

*Chi-square test indicated significant differences ($P<.05$)

Who visits the sites?

We looked at visitation in several ways to determine if there were patterns of visitation to site types by different groups. First, we looked at visitation by race/ethnicity with the three groups in the study, i.e., Non-Hispanic Whites, African Americans, and Hispanic Americans (Table 2). Second, we looked at visitation to sites by place of residence. Residence locations were determined by zip code and five groups were distinguished – Northern Suburbs, North Chicago, Central Chicago, South Chicago, and Southern Suburbs (Table 3). Finally, we looked at visitation by demographic categories (age, gender...).

Downtown Sites -- All of the sites that loaded on this factor are well known and draw users from wide-ranging areas of Chicago. Brookfield Zoo and Indiana Dunes National Lakeshore tend to draw more heavily from the south suburban areas than the other sites in the cluster. Sites that loaded on this factor had relatively high use rates for people under 40 years old and particularly high use rates for African Americans and Hispanic Americans.

Near North Sites --The three Lincoln Park sites that loaded on this factor draw a substantial portion of their visitors from north and central Chicago and the Chicago suburbs, and have a relatively high visitation rate by African Americans and Hispanic Americans. North Park Village, a relatively new and fairly small site, draws primarily from the northern part of Chicago, while Garfield Park Conservatory draws from across Cook County; but particularly its southern areas.

Far North Sites -- All sites that loaded on this factor tend to draw visitors heavily from the northern suburbs. In addition, these sites had higher visitation rates for Non-Hispanic Whites than African Americans or Hispanic Americans.

Ex-Urban Areas -- The Shawnee National Forest tended to draw most of its visitors from the south suburbs, as did the Goose Lake Prairie. Both sites had relatively high visitation rates by Non-Hispanic Whites and males.

Arboretum/ Botanic Garden -- Both sites tend to draw visitors with special interests concerning plants who may be willing to travel substantial distances to visit them. Residents of the northern suburbs are drawn to both sites, while residents of the southern suburbs tended to visit Morton Arboretum. Both sites tend to draw a high proportion of older respondents, and those with high levels of education. The Chicago Botanic Garden has relatively high participation rates for African American and Hispanic American respondents as compared to the Morton Arboretum.

The site groupings that resulted from the factor analysis are supported, in part, by previous research by Lin et al. (1988) who grouped Chicago-area sites based on perceived attributes. They produced three groups that included; (1) Morton Arboretum and Chicago Botanic Garden; (2) Lincoln Park Conservatory and Garfield Park Conservatory; and (3) seventeen Forest Preserve sites from across the Chicago area. These groupings proved useful in their efforts to develop a nested site choice model for those sites.

Table 3. Residence of Respondents Who Reported Visiting Study Sites in the Previous 12 Months, by Area of Residence (Percent of Respondents)

	Areas				
Sites	Northern Suburbs	North Chicago	Central Chicago	South Chicago	Southern Suburbs
Downtown Sites					
Museum of Science and Industry	23	20	16	18	24
Field Museum of Natural History	24	21	15	17	24
Shedd Aquarium	23	19	17	17	23
*Brookfield Zoo	23	17	16	16	28
*Indiana Dunes National Lakeshore	18	18	13	17	34
*Grant Park	21	22	16	19	22
Near-North Side					
*Lincoln Park Conservatory	20	31	17	14	17
*Montrose Point (Lincoln Park)	17	37	18	11	18
*Lincoln Park Zoo	20	27	18	16	19
*North Park Village Nature Center	20	48	13	8	11
*Garfield Park Conservatory	14	17	21	22	26
Far-North Sites					
Ryerson woods	36	12	19	12	21
Illinois Beach State Park	29	21	10	16	25
*Chain-O-Lakes State Park	42	20	7	8	23
*Moraine Hills State Park	38	16	8	11	27
Ex-Urban Areas					
*Shawnee National Forest	10	21	14	12	43
Goose Lake Prairie	10	26	12	16	35
Arboretum/Botanic Garden Sites					
*Morton Arboretum	32	18	11	11	28
*Chicago Botanic Garden	32	23	15	12	17
Midewin National Tallgrass Prairie	21	21	19	14	24

*Chi-square test indicated significant differences ($p<.05$)

Although it was not observable in the factor analysis, accessibility appears to be a third characteristic (in addition to proximity and similarity of experiences) that defines visitation patterns. For example, sites in downtown Chicago tended to draw diverse customers that are characteristic of the city population. This pattern may be due, in part, to the accessibility of these sites by Chicago's public transportation system. A previous study of choices among Chicago-area recreation sites found that travel distance to a site was a significant factor in explaining the demand for sites (Darragh et al., 1983; Dwyer et al., 1983; Lin et al., 1988; Peterson et al., 1983).

Interpreting the Factor Patterns

There appear to be a number of interrelated variables that affect participation at each of the 20 sites, and these variables combine to generate complex patterns of participation across the sites, confounding interpretation of the site clusters. First, individual respondents tended to use a fairly small number of the 20 study sites in a 12-month period, with a mean of 5 sites visited (Table 4). One respondent had visited all 20 sites, while 13 percent of respondents had not visited any of the sites.

"Sites visited in the previous 12 months" was used as a variable in the initial factor analysis to focus on those sites where an individual would be exposed to materials/messages/displays over a year--perhaps as part of an integrated information and education program. However, individuals may visit additional sites; but on a less frequent basis. When asked what sites they had "ever visited," the mean number of sites almost doubled (Table 4). This suggests that over a longer period of time, individuals are exposed to a larger number of sites -- perhaps twice as many as reported for the previous 12 months.

When we expand the analysis to "places that people have *heard of*," the average number of sites increases by another 30 percent to a mean of 13 (Table 4). Extending the scope of the investigation to "sites ever visited" or "sites heard of" means there may be more opportunities for developing and linking outreach programs than was originally believed. However, awareness and use of sites varies significantly across the population. The proportion of Hispanic Americans and African Americans that were "aware of" and "had ever visited" the sites was lower than observed for Non-Hispanic Whites. In addition, those with lower levels of education and income, and females, were less aware of or less likely to have ever visited sites than other sample segments. Older respondents tended to have visited fewer sites in the last 12 months, but reported more visits when they were asked about sites they had "ever visited" or "heard of" – most likely an expression of life-long experiences.

Overall about 40 percent of respondents reported that they do not go outside Illinois on trips to public outdoor recreation areas. When broken down by racial/ethnic group this included 33 percent of Non-Hispanic Whites, 52 percent of African Americans, and 59 percent of Hispanic Americans. Even those who did make out-of-state trips to public recreation areas were not inclined to take a large number of these trips. Of those who took out-of-state trips to public outdoor recreation areas, Non-Hispanic Whites on average took the most trips while Hispanic Americans took the fewest (Table 5). Older respondents, those that live in south suburban and central Chicago, those with lower levels of education and income, and females, took fewer trips out-of-state to public outdoor recreation areas than other groups. Individuals who stay in Illinois for most or all of their outdoor recreation are likely to be dependent on local resources for outdoor recreation, for experiencing natural resources, and for learning about the management of natural resources.

Implications for Reaching Urban Residents

Our results indicate that a large proportion of Cook County residents (40%) did not travel outside of Illinois to public outdoor recreation areas and those who did took few trips. A larger proportion of county residents had visited or at least heard of some of the 20 sites in Illinois that we asked about in this study. These two findings combined indicate that Cook County residents are highly dependent on local resources for recreation, environmental education, and experiencing a natural environment.

Patterns of individual use across the 20 sites are complex but our results hinted that individuals tend to visit sites that are in close proximity to each other, that provide similar experiences, and that are close to where the respondent lives. Study results suggest that to provide a broad

Table 4. Awareness and Use of Study Sites by Race/Ethnicity

	Mean Number of Sites		
	Anglo American	African American	Hispanic American
Visited in Last 12 Months	5	5	5
*Ever Visited	10	8	7
*Ever Heard Of	14	12	10

*ANOVA test indicated significant differences (P<.05).

Table 5. Percent of Respondents Who Traveled out of State to Visit Public Recreation Areas, by Race/Ethnicity

	Anglo American	African American	Hispanic American
*Traveled out of state (percent)	67	48	41
**Mean trips[1] (number)	10	5	5

[1] Mean trips by those who took out-of-state trips

spectrum of urban residents with opportunities for outdoor recreation, as well as experiences and information on the management and use of natural resources, is likely to take an effort that focuses on a fairly wide range of urban sites.

For Chicago and Cook County organizations seeking to develop synergistic messages across sites, it may be useful to start with sites within one of the factors identified in this study. For example, the sites that clustered on the downtown Chicago factor may provide a good starting place for such a program, given the strength of this factor and the wide range of environments and emphasis areas (i.e., an aquarium, a museum of natural history, a museum of science and industry, a zoo, and two parks) in which a natural resource message can be delivered. These sites also reach large numbers of diverse urban residents, including racial/ethnic minorities, inner-city residents, and low-income individuals who are particularly dependent on urban experiences for exposure to natural resources. The sites are also relatively well served by public transportation.

Significant questions remain about how to best design and operate an outreach effort across a number of urban sites. Important questions include (1) the effectiveness of the various diverse sites in providing key messages to visitors, (2) how the various messages at each site can be coordinated in an effective matter to achieve synergism, and (3) how to best encourage individuals to visit a larger range of sites. It would seem that an organization with a regional philosophy, logo, and information and education program – such as Chicago Wilderness (Ross 1997) -- might be effective here in developing coordinated messages, providing continuity for those messages through a common name or logo, and expanding the network of sites.

Conclusions

A survey of residents of Cook County, Illinois (including Chicago) indicates that they only take a few trips out of state each year to public outdoor recreation areas – trips that would expose them to a wider range of natural resources and resource management. In fact, significant proportions of respondents do not make out-of-state trips at all. Their knowledge of major local and regional sites is somewhat limited as well. Analysis of use over the 20 sites suggests complex patterns that include clusters of sites according to location and similar experiences provided. Particular sites tend to have unique market areas and customer profiles.

Effective strategies for reaching urban residents at urban sites are not simple or straightforward. Efforts to provide urban residents with information through urban sites should take careful note of the patterns of use across urban sites, and develop outreach strategies accordingly. It is a particularly difficult challenge to develop strategies for synergistic messages across sites; but this may be what is needed to provide a complex understanding of natural resources and their management to urban residents. Additional questions about a strategy for reaching urban residents at urban sites remain: (1) How can programs at different kinds of urban sites influence how urban residents perceive, use, and become involved in the management of other urban and ex-urban sites; and (2) How can urban residents be encouraged to visit additional sites?

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THE ROLE, USE AND BENEFITS OF NATURAL RECREATION AREAS WITHIN AND NEAR RESIDENTIAL SUBDIVISIONS

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Abstract: This paper presents results from a recent study about the role of natural resources in residential development. Data were collected using focus groups and a home owner questionnaire in selected subdivisions in two rapidly growing counties located at the urban/rural fringe of the Detroit Metropolitan area. Developers of the selected subdivisions planned for and created recreation opportunities such as trails, nature observation decks, beach and marina areas, and sledding hills for the residents. Recent home buyers considered the natural features of a lot and the neighborhood when shopping for a home, however many other factors such as highway access, schools, and financial factors were also very important. Based on questionnaire data, the most important factor in buying a house was a relaxed and comfortable environment followed closely by the natural features of the neighborhood. A majority of the residents did not visit a state or regional park in their own county and a majority did not buy an annual entrance pass for either state parks or regional parks. Finally, residents reported a wide range of social, economic, psychological, environmental and physical benefits from having natural areas beyond their own yard. Implications for public land managers, local governments, developers and residents are discussed.

Introduction

As urban areas continue to increase and expand into rural areas, the role and health of natural resources such as rivers and lakes, forested areas, and wetlands is subject to change with development and increased recreation use. Some households move into these fast developing fringe metropolitan areas to leave the urban environment, while other households move to fringe areas because of the draw of the rural area and natural resource amenities. Studies done in the 1970s (e.g., Duncan & Newman, 1976; Michelson, 1977) show home buyers seek new housing to be closer to work, for more living space, a desire to live with compatible neighbors, and leave urban ills such as noise and pollution. Studies of home buying in outlying rural areas show people are attracted to the outdoors, trees, and the natural settings (Marans & Wellman, 1978; Stewart & Stynes, 1994). More recent studies on home decision making (Davis, Nelson & Dueker, 1994; Feitelman, 1993; Nelson, 1992) have begun to document the draw of living in tranquil environments and near preserved land and parks. As development continues into rural areas with natural resources, local and regional governments, developers, real estate firms and both long-time and newer residents will need a better understanding of the role, uses, and benefits of natural resources. Today, limited information exists about the role of natural resources in the decision processes of residential developers, homebuilders, and residents who have purchased homes in resource areas.

The purpose of our larger study is to understand how natural resources, including recreational opportunities, are considered by both developers in buying land and consumers in buying homes relative to other factors. This information can assist with conservation planning and programs undertaken by government, developers or citizens.

This presentation and paper focused on findings about recreation opportunities within and nearby newly developed subdivisions. Specifically the following research questions are addressed: (1) what natural recreation amenities do developers create in their subdivisions, (2) what role do recreation opportunities play in home and neighborhood selection, (3) to what extent do residents recreate in their neighborhood (besides their own yard), (4) to what extent do resident visit nearby large natural resource areas (i.e., state recreation areas, regional county parks), and (5) what benefits do residents derive from natural resources in their neighborhood.

Methods

Two counties outside the metro Detroit area were selected as the study area. Specifically, Livingston and Washtenaw Counties were studied because of their recent rapid population growth and residential development, which has occurred in significant natural resource areas. The two counties both contain a major river corridor (the Huron River), several regional parks, several state recreation areas, and significant acres of forested private land. Importantly, these two counties are located along the urban/rural interface and are currently experiencing many of the signs of urban sprawl.

Over a 12 month period, data were gathered from a convenience sample of local government officials and planners (n=9), residential developers (n=4), environmental groups (n=5), and residents (n=85) living in newer subdivisions which satisfied five selection criteria. The criteria applied to subdivision selection included: (1) location within one of the two counties studied, (2) availability of natural resources within or near the subdivision, (3) developments no older than eight to ten years old, (4) subdivisions of at least 25 houses, and (5) a variety of housing prices represented so that approximately half of the subdivisions studied represented housing under $250,000 and the other half $250,000 or more. Residents were queried as part of focus groups held at a home in the subdivision, while government officials, developers and environmental group officials were interviewed

individually. Interview or focus group scripts were used, sessions were taped, and comments were transcribed and analyzed. Residents also completed a five-page questionnaire during the focus group which provided limited quantitative data. This paper reports primarily results from the resident portion of the study.

Findings

Research question one asks "what natural recreation amenities do developers create in their subdivisions." Developers have many options in developing recreation amenities and preserving natural resources with subdivisions. Two of the twelve subdivisions studied included eighteen hole golf courses, in addition to other forms of un-buildable land or open space that was preserved. Seven other subdivisions which were labeled "forested open space neighborhoods" included natural resources such as forested areas, trails, lakes or ponds, wetlands, and limited playground or sport areas. These resources were owned by all of the residents of the subdivision. Three subdivisions which were labeled "limited open space neighborhoods" included no or few natural areas held in shared ownership. A summary of recreation and natural resources within, adjacent to, and nearby the subdivisions studied is found in Table 1.

Research question two asks "what role do recreation opportunities play in home and neighborhood selection." Many residents mentioned the importance of having a neighborhood where children could play safely, being able to exercise in the out-of-doors close to home, and being able to golf out their backyard, to just name a few comments made during focus group sessions. Using a likert-scale question, subdivision residents were also asked to think back to their home buying process and rate a list of 16 factors on the importance that each factor had when buying their current home. As shown in Table 2, the top two factors were a relaxed and comfortable environment and the natural features in the neighborhood. Three additional factors scoring four or more on the five point scale were the design of the neighborhood, location of the community, and the natural features of a specific lot. Several factors scored differently across the three types of subdivisions (i.e., forested, golf, limited). For example, home buyers in forested subdivisions rated natural features as more important than home buyers in limited open space subdivisions.

Research question three asks "to what extent do residents recreate in their neighborhood (besides their own yard)." A wide variety of outdoor recreation facilities and activities could be found across the twelve subdivisions studied. This list came from comments made during the focus groups sessions and from site visits. The most common recreation facility was wood chip trails, generally one mile or longer and located in the shared open space. Other outdoor facilities included paved trails not along the streets; fields for soccer, football or baseball; sledding hills; picnic areas; beaches and swimming areas; marines for boating, sailing and canoeing; fishing docks; gazebos or decks overlooking wetlands for wildlife viewing; golf courses; and neighborhood outdoor parties or sport games. In addition, some subdivisions included more traditional recreation features such as basketball courts, playgrounds, and volleyball courts.

Research question four asks " to what extent do residents visit nearby large natural resource areas (i.e., state recreation areas, regional county parks)." While the researchers believed that nearby recreation facilities would be important to these home buyers, this feature was rated the least important in their home buying decision (see Table 2). The low consideration score is also reflected in the low park visitation levels. Table 3 provides data on the purchase of recreation annual passes for home owners in both counties. The most common purchase pattern across both counties was that neither a state park pass or regional park pass was purchased. Livingston County home owners studied were slightly more likely than the Washtenaw home owners to have purchased a state park annual pass. A greater portion of Washtenaw County home owners were likely to purchase both state and regional park passes. Livingston County home owners studied were very or fairly close to four parks and were asked how frequently they visit each park. Table 4 shows that a small percentage used the parks on a weekly basis. Kensington Metropark was the most popular regional park. Home owners typically had not visited the other three parks in the area.

The last research question asks "what benefits do residents derive from natural resources in their neighborhood." Answers for this question come from responses made during the focus group sessions and satisfaction ratings on the same factors scored for their importance when purchasing a home. Benefits were organized around benefit categories developed by Driver et al. (1991). These included social, economic, psychologic, environmental and physical benefits. More specifically, social benefits included a sense of community and stewardship that comes along with residents getting together and taking care of the open space and natural resources, and the convenience of being able to recreation and exercise very near to home. The economic benefits of having natural resources and open in a neighborhood centered around home appreciation. Many home owners had experienced or believe their homes would appreciate faster because these subdivisions were very desirable to live in. Psychologic benefits included the tranquility of being surrounded by nature which was relaxing, therapeutic, less stressful and calming; and the feeling of being on vacation every day in a vacation-like setting. Environmental benefits included habitat watching, the opportunity to teach children about the environment, and nature appreciation. Finally, the physical benefits referred to natural resources (i.e., trees) acting as a buffer between homes and other nearby land uses. Trees also provided privacy and a sense of distance from other houses. Satisfaction ratings were generally high (four or higher on a five point scale) across the nine items tested (reduced from the importance list to only measure natural resource or recreation factors). Home owners in the seven forested open space subdivisions studied were more satisfied with natural features, in general, compared to residents of the golf or limited subdivisions. For satisfaction scores see Table 5.

Table 1. Recreation Amenities and Natural Resources in Residential Developments

Name of Development	Township	County	Natural Resources/ open space within	Natural resources/ open space adjacent to	Natural resources nearby (within five miles or fifteen minutes)
Golf Course					
Oak Pointe	Genoa	Livingston	Golf course, lake, beach, marina, tennis courts, nature preserve	Brighton State Recreation Area (State of Michigan), Burroughs Recreation Park	Mt. Brighton Ski Area (Private)
Stonebridge	Pittsfield	Washtenaw	Golf course, pond	none	none
Forested					
Cobblestone Creek	Hamburg	Livingston	Trails, forests	none	Several small lakes within two miles. Public access is not known. Lakeland Rail-Trail
Hunters Pointe	Hamburg	Livingston	Trails, forests, gazebo	Shared open space resources(wetland and trail) with another open space community built by same developers	Huron Meadows Metropark, Brighton State Recreation Area, Island Lake State Recreation Area
Lakeshore Pointe	Oceola	Livingston	Lake, forests, trails	Thompson Lake	City of Howell parks
Solitude Pointe	Hamburg	Livingston	Baseball/ soccer fields, trails, forest	Private camp and recreation club	Huron Meadows Metropark, Brighton State Recreation Area, Hamburg Township parks
Brass Creek	Webster	Washtenaw	Playground, wooded lot, pond	Huron River	Hudson Mills Metropark
Matthaei Farms	Ann Arbor	Washtenaw	Ponds, wetlands, rolling terrain, prairie, forest, trails	Sheep farm, botanical gardens, golf course (University of Michigan)	Gallup Park (City of Ann Arbor)
Wildwood	City of Saline	Washtenaw	Wetlands, trails	none	City of Saline parks on the other side of town
Limited					
Lakewood Knoll	Genoa	Livingston	Wetlands	none	Lake Chemung
Bates Farms	Scio	Washtenaw	Forest on perimeter	none	Lima Township park, Hudson Mills Metropark
Ford Lake Heights	Ypsilanti	Washtenaw	none	Ford Lake, forests and trails (Ypsilanti Township)	Ypsilanti Township parks, township forest preserve and trails

Table 2. Factors Considered When Buying Current Home by Focus Group Participants

	Types of Open Space Neighborhoods			
Characteristics:	Forested (n=50)	Golf (n=14)	Limited Resource (n=21)	Composite Mean (n=85)
Characteristics rated differently by residents				
Natural features in neighborhood	4.5[a]	4.0	4.0	4.3
Design of neighborhood	4.4	3.8	3.6	4.1
Natural features of lot	4.1	4.0	3.6	4.0
Lot sizes in neighborhood	4.0	3.3	3.8	3.8
Open space and shared recreation areas in neighborhood	4.0	3.3	3.1	3.7
School district	4.2	3.2	3.0	3.7
Characteristics rated similarly by residents				
Relaxed and comfortable environment	4.4	4.3	4.3	4.4
Location of community	3.9	4.0	4.2	4.1
Rural atmosphere	3.7	3.9	3.8	3.8
Sense of community	3.7	3.8	3.8	3.8
Access to highways and interstate	3.7	3.5	3.7	3.7
Size of houses in neighborhood	3.6	3.2	3.4	3.5
Like-minded people in neighborhood	3.2	3.5	3.3	3.3
Proximity to job	3.3	2.8	3.2	3.2
Proximity to retail	3.2	2.6	2.6	2.9
Proximity to state recreation areas, Metroparks, lakes, and Huron River	2.9	2.4	2.8	2.8

a. Scale where "1" equals not at all important to "5" equals extremely important.

Table 3. Purchase of Recreation Entry Passes

	Livingston (n=50)	Washtenaw (n=35)
Michigan State Parks annual pass	18%	9%
Huron Clinton Metroparks annual pass	18	19
Both annual passes	10	22
No annual passes purchased	54	50
Total	100.0%	100.0%

Table 4. Usage of Selected Livingston County Parks by Livingston County Focus Group Participants (n=50)

Selected Livingston County Parks	Never	Few times a year	Once a month	Couple times a month	Weekly
Huron Meadows Metropark (Brighton)	54%	29	6	6	4
Kensington Metropark (Brighton/Milford)	28	52	6	10	4
Brighton Recreation Area (Brighton/Howell)	49	37	6	6	2
Island Lake Recreation Area (Brighton/South Lyon)	67	22	2	8	0

Table 5. Satisfaction with Factors Considered At Purchase Time by Focus Group Participants

	Types of Open Space Neighborhoods			
Characteristics:	**Forested (n=50)**	**Golf (n=14)**	**Limited Resource (n=21)**	**Composite Mean (n=85)**
Characteristics rated differently by residents				
Natural features in neighborhood	4.6[a]	3.2	3.7	4.3
Relaxed and comfortable environment	4.5	4.2	4.0	4.3
Design of neighborhood	4.3	4.0	3.6	4.1
Natural features of lot	4.3	4.1	3.5	4.1
Sense of community	4.3	3.8	3.8	4.1
Lot sizes in neighborhood	4.2	3.9	3.8	4.1
Open space and shared recreation areas in neighborhood	4.3	3.9	3.1	3.9
Characteristics rated similarly by residents				
Proximity to state recreation areas, Metroparks, lakes, and Huron River	4.2	3.9	4.1	4.1
Rural atmosphere	3.9	3.9	3.4	3.8

a. Scale where "1" equals extremely dissatisfied and "5" equals extremely satisfied.

Conclusions and Implications

Our results show evidence that recreation and natural resources beyond a yard, but still within a subdivision, are important to home buyers. Moreover, high levels of satisfaction results from being surrounded by a natural environment. While our results were gleaned from adults, many references were made about children's lives being enhanced by nature and outdoor recreation activities. The households studied appear to have a stronger desire for natural environments and recreation opportunities in their neighborhoods rather than at nearby local, regional, or state parks or natural areas.

The idea of a subdivision built within or nearby major metropolitan areas is not new. What appeared to be different about the subdivisions we studied were that they all incorporated some form of open space. With the exception of one subdivision in the limited open space category, which happened to be the oldest one we studied, some type of resource (mostly forested land) was jointly shared amongst the residents. This shared resource, in most cases, created a wide variety of recreation opportunities within a neighborhood which the resident's felt brought satisfaction and benefits. These open space areas and recreation facilities that developers created during the building process also required care and maintenance by the residents.

In conclusion, five themes evolved from our research on natural recreation areas in subdivisions. The first theme is the "cocooning effect." For the residents we studied, they appear to be looking for an inclusive environment, including natural beauty, resources, and recreation. A second theme is "limited access." Of the subdivisions we studied few had proximity or access to other neighborhoods or community amenities such as schools, other trails, or nearby parks. Residents also showed concern for outsiders using their private open space land and recreation areas. A third theme, "involvement", described that these nature-based subdivisions appear to attract and encourage individuals to participate in conservation efforts who might otherwise not be involved. The fourth theme is "caring and stewardship." The shared resources require some level of caring which ranges from paying low association fees and performing volunteer work to paying high fees and hiring outside landscaping services. The last theme of our research findings is "assistance." While we found stewardship efforts in each of the subdivisions, there is a need to help these residents understand the resources in their neighborhood and how to best sustain them, possibly through County Extension agents, or a city or county forester or recreation maintenance specialist.

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