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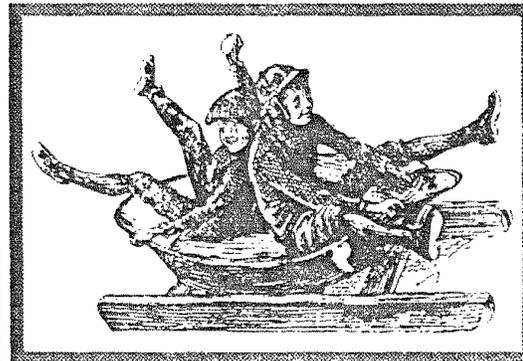
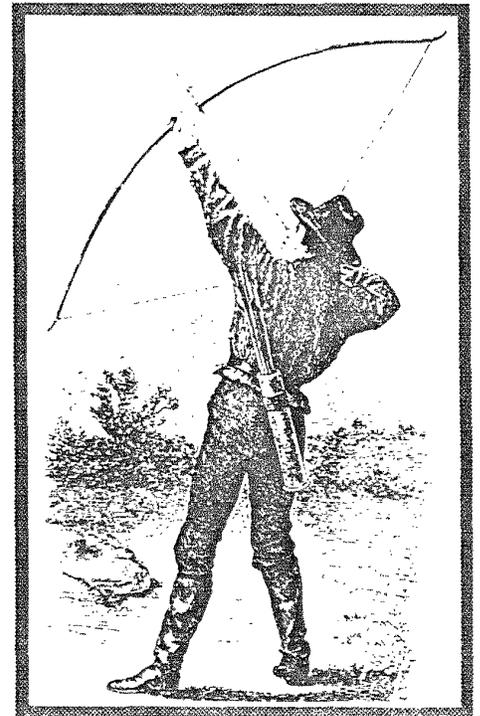
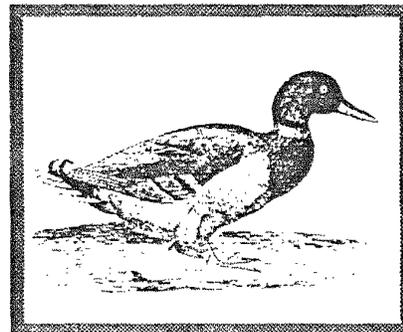
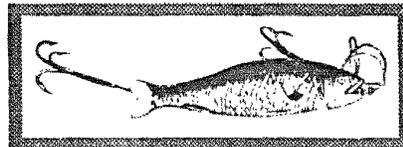
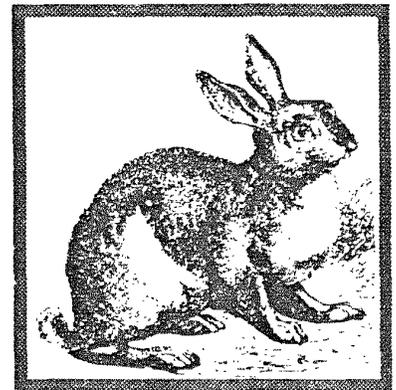
Northeastern Forest  
Experiment Station

General Technical  
Report NE-198



# Proceedings of the 1994 Northeastern Recreation Research Symposium

April 10-12, 1994  
Saratoga Springs, New York



## NORTHEASTERN RECREATION RESEARCH MEETING POLICY STATEMENT

The Northeastern Recreation Research meeting seeks to foster quality information exchange between recreation and travel resource managers and researchers throughout the Northeast. The forum provides opportunities for managers from different agencies and states, and from different governmental levels, to discuss current issues and problems in the field. Students and all those interested in continuing education in recreation and travel resource management are particularly welcome.



# Melding Research and Management

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*NOTE: These proceedings have been prepared using electronic and hard copy supplied by the authors. While some editing has been done, authors are responsible for the content and accuracy of their papers.*

# **PROCEEDINGS of the 1994 NORTHEASTERN RECREATION RESEARCH SYMPOSIUM**

**April 10-12, 1994  
State Parks Management and Research Institute  
Saratoga Springs, New York**



**Compiled and Edited by:**

Gail A. Vander Stoep, Michigan State University

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## MISSING PAPERS

*NOTE: If you are interested in getting additional information about any of the papers that were presented but were not submitted for publication, please contact the authors directly. A list of those papers is included here to assist you in identifying authors.*

### POSTER SESSION

Fees, Expectations and Behavior in Developed Campgrounds. Tom More, USDA Forest Service.

Spatial Inquiry, Analysis and Display of Site-specific Perceived Impacts to the Recreational Boating Experiences: A Comparison of GIS Software Packages and Procedures. John Confer, Jr., Alan Graefe, Pennsylvania State University; John Titre, U.S. Army Corps of Engineers.

### OUTDOOR RECREATION MANAGEMENT

Visitor Impact Monitoring: Evaluating the Effectiveness of Management Actions. Jeff Marion, Virginia Tech, National Biological Survey.

Undergraduate Tourism Education in New Hampshire and Hungary: A Comparative Study of the Curriculum Development Process. Margit Mundruczo, Robert Robertson, University of New Hampshire.

The Gericke Farm Project. John Wood, Clay Pit Ponds State Park Preserve.

### INTERPRETATION, EDUCATION AND OUTREACH

Evaluating the Effectiveness of Alternative Media Messages. James Petruzzi, Cinnamon Baldwin Foster, Jerry Vaske, Maureen Donnelly, Colorado State University.

"Public Outreach" Implications for Natural resource Recreation Management. William DelNegro, David Loomis, University of Massachusetts.

### DEMOGRAPHICS

Demographics and Angler Diversity: Cohort-specific Analysis of Massachusetts Anglers. Al Ortiz, David Loomis, University of Massachusetts.

### RECENT CHANGES IN FEDERAL AGENCY RECREATION RESEARCH AND TRAINING PROGRAMS

Recreation, Social Science and Human Dimensions--Fitting Together. Alan Watson, USDA Forest Service, Aldo Leopold Institute.

Future of Social Science in NPS and NBS. James Carroll, National Biological Survey, Washington, D.C.

### OUTDOOR RECREATION: SATISFACTION AND CONFLICTS

The Hidden Public: Subculture Differences in Attitudes and Satisfaction. Rodney Zwick, Lyndon State College; David Tucker, Northeast Kingdom Community Action; Susan Bulmer, Vermont Department of Forests, Parks and Recreation.

### ENVIRONMENTAL PERCEPTIONS AND ETHICS

State Park Stewardship Survey--1993 State of the Parks Report. Allison McLean, Wilbur LaPage, New Hampshire Division of Parks and Recreation; Rob Robertson, University of New Hampshire.

## PLANNING AND G.I.S.

Boating Opportunities: A Geographical Analysis of Travel Patterns and Motivations. John Confer, Jr., Alan Graefe, Pennsylvania State University; John Titre, U.S. Army Corps of Engineers, WES.

The Moosalamoo Partnership: Using GIS and CPS for Composite Trail Maps. David Capen, Daniel Coker, University of Vermont; Mary-Jeanne Packer, Green Mountain National Forest.

*OUTDOOR RECREATION  
MANAGEMENT*



# SPECIFIC RESPONSIBLE ENVIRONMENTAL BEHAVIOR AMONG BOATERS ON THE CHESAPEAKE BAY: A PREDICTIVE MODEL

## PART II

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This paper examines predictors of boater behavior in a *specific behavior* situation, namely the percentage of raw sewage discharged from recreational vessels in a sanitation pumpout facility on the Chesapeake Bay. Results of a multiple regression analysis show knowledge predicts behavior in specific issue situations. In addition, the more specific the behavior indicator, the better predictive ability that indicator will have on behavior.

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### Introduction

Responsible environmental behavior (REB) is defined as any individual or group action aimed to do what is environmentally right to help protect the environment (Sivek & Hungerford, 1989/90). This behavior involves a conscious awareness of environmental problems among individuals or groups of people while demonstrating an understanding and sensitivity of the importance for a quality environment. In addition, the knowledge of action skills to effectively partake in REB are necessary for an individual to actively participate in pro-environmental action (Hines et al., 1987; Marcinkowski, 1988; Hungerford and Volk, 1990).

The purpose of this paper was to present findings for Part II of a model of responsible environmental behavior. Part I of the model, which focused on the relationship between four socio-demographic variables, three general environmental variables, and general responsible environmental behavior, was presented at the 1993 NERR conference. This paper examined predictors of a *specific responsible environmental behavior*, namely the percentage of raw sewage Maryland boaters discharged from recreational vessels in a sanitation pumpout facility on the Chesapeake Bay. According to Heberlein and Black (1976), more specific measures of behavior are stronger indicators of specific behavior than are general measures of behavior. Several specific-issue variables were used to test Heberlein and Black's specificity claim by using indices such as knowledge of water pollution issues, awareness of the consequences of raw sewage on water quality, personal commitment to resolve water pollution issues, and situational factors that constrain sewage pumpout station usage.

### Methods

Data were collected during fall, 1992, through mail surveys sent to a stratified random sample of owners of vessels 22 feet or larger in Maryland. The instrument included measures of knowledge of water pollution issues, awareness of the consequences of raw sewage on water quality, personal commitment to resolve water pollution issues, situational factors that constrain sewage pumpout station usage, and specific responsible environmental behavior (percentage of raw sewage boaters discharged). A total of 291 surveys were returned, representing a 41 percent response rate. In order to assess

nonresponse bias, phone interviews were conducted with a random sample of nonrespondents (N=30). Of those phone survey respondents who recalled receiving a mail survey last fall (54%; N=19), 63 percent were classified as *nonusers* based on their reason for not completing the survey, i.e., they did not go boating in 1992. Another 61 respondents did not meet criteria necessary for analysis in this study and were eliminated from the sample (Cottrell, 1993).

### Results

The uniqueness of those boaters surveyed in this study was likely due to the random stratification process used to sample registered boat owners with 22 foot boats or larger in Maryland. Of the boat types reported, 56 percent were power boats and 44 percent were sailboats. The average boat length was 31 feet. The mail survey went to registered boat owners. Ninety-seven percent of this sample were males with an average age of 50, while 78 percent were married. Thirty-six percent have children living at home (Cottrell, 1993).

This group represents a well educated, affluent, conservative, white collar segment of the population. For instance, 63 percent have a college degree, including 39 percent who participated in post graduate work. More than 30 percent of the respondents had an earned income of more than \$100,000 in 1992, followed by 35 percent between \$60,000 and \$99,999. The median income earned was approximately \$70,000 as compared to \$30,000 in a study of boaters at large in Miami, Florida (Noe and Snow, 1990) and a median range of \$30,000 to \$40,000 for boaters in a Delaware study (Falk et al., 1985). There was a significant positive correlation between income and education. In reference to political affiliation, 51 percent were Republicans in comparison to 22 percent Democrat. Another 23 percent of the boaters were independents. Subsequently, 56 percent were conservative and 22 percent were liberals. Pertaining to occupational status, more than 60 percent of the total respondents were white collar workers. To illustrate, 31 percent reported a professional occupational status while 21 percent indicated that they were in management. Another nine percent were in a business related occupation (Cottrell, 1993). These boaters were relatively experienced with an average of 21 years experience and 77 percent perceived themselves as advanced or expert boaters. This group went boating an average of 35 times per year on the Chesapeake Bay. As number of days boating on the bay increased, both boat length and perceived skill level increased. Years experience and boating skill level increased with age.

In reference to the relationship between sociodemographics and the pool of specific issue variables, as age increased an awareness for the consequences of raw sewage on water quality decreased (Cottrell, 1993). Power boaters were more aware of the consequences of dumping raw sewage than were sailboaters. Boaters with an earned income between \$40,000 and \$79,999 in 1992 were the most aware of the consequences of raw sewage discharge on water quality. More educated, affluent, older boaters were less likely to use a sewage pumpout station than were boaters on the lower end of the socioeconomic scale. Meanwhile, powerboaters (72%) reported pumping a greater percentage of waste in a pumpout station than sailboaters (44%).

A two-step process was used in the operationalization of several indices for analysis in this study. A factor analysis was carried out to examine four scaled variables. Those scales were knowledge about environmental issues related to water pollution, personal commitment to resolve water pollution, awareness of consequences of water pollution, and situational factors that constrain boater use of sewage pumpout stations (Cottrell, 1993). Next, Cronbach alpha was utilized to test the internal consistency of each index. A perceived knowledge of water pollution issues index was computed as the mean of responses to four statements. The level of reliability was acceptable (Cronbach Alpha = .84). Measurement of personal commitment to resolve water pollution problems was accomplished by computing the mean of responses to five related statements. The intercorrelation of the five items resulted in an overall reliability of .78. Next, the combined

strength of two factors identified in a factor analysis provided an internally consistent scale (Cronbach Alpha = .77) to measure boater awareness of consequences of raw sewage discharge on water quality. This scale consisted of six items probing the general degree of awareness about the harmful effects raw sewage has on health and water quality. Finally, to assess those situations that might constrain or enhance boater use of sewage pumpout stations, a situational factors index was created as the sum of statements specifically related to the use of a sewage

pumpout station. This scale had the highest level of reliability (Cronbach Alpha = .86) of all the indices examined.

An attempt was made to develop an index to measure boater knowledge of the laws pertinent to raw sewage disposal. The reliability of those items in the scale were too low, thus all three items were used as separate independent variables in the multiple regression analysis (Table 1).

Table 1. Reliability statistics for the knowledge about the laws index (n=230).

Knowledge of Law Statement	Item Mean <sup>a</sup>	Standard Deviation	Corrected Item-Total Correlation	Alpha If Item Deleted
How far offshore must you be before you can legally discharge human waste at sea?	.69	.47	.38	.32
How far offshore on the Chesapeake Bay must you be before you can legally discharge human waste?	.60	.49	.33	.40
Which one of these organizations is responsible for enforcing dumping at sea violations?	.70	.46	.27	.50
Overall Index <sup>b</sup>	2.0			.51

<sup>a</sup> Scores for these items were coded 0=incorrect and 1=correct.

<sup>b</sup> Range = 0 - 3

Drawn from a previous study of sewage pumpout station use on a national level (Price Waterhouse, 1992), specific responsible environmental behavior, the primary dependent variable in this study, was concerned with what boaters do with their marine sewage (percentage of waste discharged in a sewage pumpout station). Determined from a three part question, this item asked respondents to approximate in 1992 how much raw sewage they discharged into the water more than three miles off-shore (WASTE1), into the water less than three miles off-shore (WASTE2), or by pumping into a sanitation pumpout facility on-shore (WASTE3). Percentages add up to 100 percent. Waste3, percentage of human waste pumped in a sanitation pumpout facility, represents SRFB. Approximately nine percent of the raw sewage discharged from recreational vessels in this study was reportedly pumped directly into water more than three miles offshore (WASTE 1). Meanwhile, 31 percent was discharged directly into the water less than three miles from shore (WASTE 2), thereby reflecting illegal behavior. Fifty-nine percent of the waste was reported to be pumped into a sanitation facility (WASTE 3) which indicates appropriate behavior (Table 2).

Table 2. Average waste discharged by Maryland boaters.

	N=210
WASTE 1: Discharged directly more than 3 miles offshore	9.5%
WASTE 2: Discharged directly Less than 3 miles offshore	31.4%
WASTE 3: Discharged by using a sanitation pumpout facility	59.1%
	100.0%

A multiple regression analysis showed eight predictors of specific responsible environmental behavior (% of waste pumped in a pumpout station) which collectively explained 46 percent of the total variance (Table 3). Three background variables (education,  $B=-.231$ ,  $p<.05$ ; boat length,  $B=-.246$ ,  $p<.001$ ; and years of boating experience,  $B=-.248$ ,  $p<.001$ ) were negatively related to sewage pumpout station usage. Environmental concern, representing a pool of general environmental variables, was a moderate predictor ( $B=-.173$ ;  $p<.01$ ). Four specific issue predictors included knowledge of water pollution issues ( $B=.140$ ;  $p<.05$ ), knowledge of the law about dumping on the bay ( $B=.281$ ;  $p<.001$ ), knowledge of the law about dumping at sea ( $B=-.133$ ;  $p<.05$ ), and awareness of the consequences of raw sewage on water quality ( $B=.426$ ;  $p<.001$ ).

Table 3. Results of multiple regression of background variables, general environmental variables, specific issue variables, general responsible environmental behavior, and situational factors on specific responsible environmental behavior (n=177).

Independent Variables	Dependent Variable Specific Responsible Environmental Behavior	
	<i>Regression Model</i>	
	r	Beta
<u>Background Variables</u>		
Income	-.144	-.030
Age	-.147***	-.014
Stand on Political Issues	-.063	-.015
Education	-.170*	-.231***
Boat Length	-.333***	-.246***
Boat Skill Rating	-.122	-.068
Years Experience	-.202**	-.248***
Days Boating On Bay	.065	.028
<u>General Environmental Variables</u>		
Environmental Concern	.028	-.173**
Verbal Commitment	-.032	-.089
Knowledge of Ecology	-.011	-.063
<u>Specific Issue Variables</u>		
Knowledge of Water Pollution	.194**	.140*
Knowledge of Dumping On Bay	.193**	.281***
Knowledge of Dumping Offshore	-.155*	-.133*
Knowledge of Enforcement	-.120	-.067
Awareness of Consequences	.447***	.426***
Commitment to Issue Resolution	.108	-.032
<u>Other Variables</u>		
General Responsible Environmental Behavior	.100	-.031
Situational Factors	.333***	.115
R <sup>2</sup> Entire Model		.455***

\*\*\* Significant at .001

\*\* Significant at .01

\* Significant at .05

Table 3 summarizes the results of a multiple regression invoked to determine the contribution of nineteen independent variables, which are categorized into four dimensions, in explaining the variation in the amount of raw effluent pumped into a sewage dump station (SPS). Three background variables, one general environmental variable, and four specific issue variables accounted for 46 percent of the variance in the amount of sewage discharged on shore. Neither general responsible environmental behavior nor situational factors contributed to the model, although the situational factors scale was significant and positively correlated with SREB. An awareness of the consequences of dumping raw sewage ( $B=.416$ ;  $p<.001$ ) in the bay was the most important indicator of SREB followed by knowledge of the law about dumping on the bay ( $B=.281$ ;  $p<.001$ ), years boating experience ( $B=-.248$ ;  $p<.001$ ), boat length ( $B=-.246$ ;  $p<.001$ ), education ( $B=-.231$ ;  $p<.05$ ), environmental concern ( $B=-.173$ ;  $p<.01$ ), knowledge about water pollution ( $B=-.140$ ;  $p<.05$ ), and knowledge of the law about dumping offshore ( $B=-.133$ ;  $p<.05$ ), respectively.

### Conclusions

Eight predictors of specific responsible environmental behavior (SREB), as reflected by the percentage of waste discharged in a sewage pumpout station, were determined. The combination of all eight predictors accounted for 46 percent of the total variance explained. Several background variables, initially hypothesized to have an indirect positive effect, were found to have a direct relationship with SREB; however, a negative influence was noted for education, boat length and years experience on SREB. Of the general environmental variables, originally hypothesized to have an indirect positive effect, environmental concern had a direct inverse influence on SREB. The specific issue category of variables was found to have the strongest influence on SREB. For instance, knowledge of water pollution, knowledge of no discharge on the bay, and awareness of consequences each had a direct positive effect; while knowledge of the law about discharge offshore was found to inversely effect SREB. Surprisingly, neither general responsible environmental behavior (GREB) nor situational factors when combined with the other variables in the model influenced the percentage of waste pumped in a sewage pumpout station. GREB represented respondent reports to ten "true-false" items. Each of the statements represented a specific action taken towards an environmental issue. On a scale of one to ten, the mean response was 4.9; that is, on average, boaters reported participating in five out of ten pro-environmental actions. It was proposed that general pro-environmental behavior would directly and positively influence specific issue responsible behavior. That was not the case in this study.

With regard to situational factors, the composite of five statements, in essence, measured a convenience scale of sanitation pumpout station use. As expected, this scale was significantly and positively correlated with SREB, yet it was not found to predict SREB when the direct effect was controlled by the other variables in the regression model. On a bivariate basis, as boaters level of agreement about the convenient use of an SPS increased, they were more likely to use a sewage pumpout to discharge a greater percentage of waste after a boating trip.

In summary, results show knowledge predicts behavior in specific issue situations. In addition, to support Heberlein and Black's (1976) specificity claim, this study showed that the more specific the indicator was in relation to the actual behavior being measured, the stronger predictive ability that indicator will have on behavior.

### Implications

Implications for marina management are that as boat length increases, boat owner perceptions of the convenience of sewage pumpout station usage decreases, thus they are less likely to use a pumpout station. Findings in this study indicate that mobile pumpout stations may be an alternative solution to encourage further use. Secondly, knowledge variables in this study proved to be good predictors of pro-environmental behavior. Continual public education about SPS locations and the benefits derived from not discharging in the Bay might encourage further SPS usage.

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## POTENTIAL REVENUES FROM A

### NEW DAY-USE FEE

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The Corps of Engineers will be implementing a new user fee at day-use areas during the next two years. This paper presents the procedures used to estimate the revenue that the new fee would generate at six Corps projects located across the U.S. The results suggest that revenues will fall well short of the naive projection calculated on the assumption that the new fee will not affect the current level of visitations.

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#### Introduction

The Army Corps of Engineers is one of the leading federal agencies in providing recreational opportunities. In fact, the Corps accommodates more visits at its recreation sites than any other federal agency except the U.S. Forest Service. Both day-use and camping facilities are provided at most Corps projects throughout the U.S.

Although the Corps has a long history of charging fees at its campgrounds, it has not charged fees at its day-use facilities in the past. This is about to change due to provisions included in President Clinton's compromise budget package passed last summer by Congress. The budget package reduced the Corps' federal operating budget by \$18 million, and it granted the Corps the authority to charge fees at its day-use facilities, beginning in 1994.

Because user fees have not been charged historically at day-use areas, the Corps had no information about how current users would respond to the proposed fee system. Consequently, a study was conducted to learn more about Corps day-users' attitudes toward fees and how they would respond to the user fee. One of the major objectives of the study was to estimate the revenue that the Corps would collect at selected Corps projects. The purpose of this paper is to present the procedures used to estimate day-use fee revenues and to compare the estimated revenue projections to a naive estimate of revenue.

#### Study Design and Data Collection Procedures

A total of eighteen Corps projects were visited to assess their suitability for the fee study. Criteria used to assess each project are: at least two day-use areas that contained beaches, picnic table and boat launching facilities, which are required facilities for charging a fee; day-use areas with varying degrees of development; different locations across the U.S. so that regional differences, if any, in users' reactions to fees could be considered; a mix of highly accessible and remote projects; and adequate locations where traffic could be safely intercepted to collect name and addresses of users.

Based on the above criteria, the following six projects were selected for the study: Burnsville, West Virginia; Strom Thurmond on the South Carolina-Georgia border; J. Percy Priest, Tennessee; Truman, Missouri; Canyon, Texas; and Mendocino, California. Two day-use areas at each project were selected for collecting the names and addresses of current users. A sampling plan was then developed for each day-use area at each project.

A questionnaire was developed and pretested prior to the data collection phase of the study. The final version of the survey instrument contained general questions about the recreational activities of respondents, the types of facilities and services they considered important, users' assessment of the quality of the day-use facilities they visited, and detailed information about their trip to the day-use area on the day they were contacted.

Questions about respondents' trip expenditures and the number of trips they had made to the day-use area in the last year were also included. Finally, a question was designed to determine how current users would respond to a fee system and the number of trips they would make to the day-use area at alternative fee levels. Two types of fees were included: an annual fee for the day-use area and a daily fee. Both fees were expressed on a per-vehicle basis.

A sample of day users was collected at each project by randomly stopping vehicles and collecting the name and address of the driver. Those selected for the sample were then mailed a survey and appropriate follow-ups to obtain the desired information. A total of 1405 of the 2522 deliverable surveys were completed and returned, yielding a response rate of 55.7 percent.

#### Results

**Sample Characteristics.** The socio-demographic characteristics of the day-use respondents are summarized in Table 1. The average age of respondents was slightly more than 40 years, and males accounted for over 60 percent of all respondents. Average household size was 3.1 persons and respondents reported an average of 13.3 years of education and an income of \$36,600. Respondents who identified themselves as members of minority groups accounted for 11.6 percent of all respondents. It should be noted that all socio-demographic characteristics reported in Table 1 are statistically different at the 10 percent level across the six projects.

Table 1. Socio-demographic characteristics of Corps day-use visitors.

Characteristic	Average	Range Among Projects
Age (years)	40.2	35.5 to 44.7
Sex (% Male)	61.5	56.3 to 69.4
Household Size	3.1	2.9 to 3.3
Education (years)	13.3	12.5 to 13.9
Household Income	\$36,300	\$25,600 to \$40,100
Race (% non-caucasian)	11.6	4.0 to 18.9

Selected trip characteristics are reported in Table 2 (see next page).

Table 2. Trip characteristics of Corps day-use visitors.

Characteristic	Average	Range Among Projects
Number of People in Party	3.2	2.9 to 3.4
Hours Spent at Site	5.0	4.2 to 6.7
One-Way Travel Distance	30.2	12.0 to 45.0
Trip Expenses	\$36.40	\$16.50 to \$46.80
Annual Trips to Site	21.0	8.7 to 40.7
Quality Rating for Site <sup>a</sup>	3.7	3.2 to 4.0
Preference Rating for Site <sup>b</sup>	2.3	2.2 to 2.5

<sup>a</sup> The following numerical scale was used to measure quality:  
1=poor; 2=fair; 3=good; 4=very good and 5=excellent.

<sup>b</sup> The following numerical scale was used to measure preferences:  
1=I would not go elsewhere in this region;  
2=I would go elsewhere, but I prefer this day-use area;  
3=It makes no difference to me whether I use this day-use area or another area;  
4=I would come here again, but I would prefer to go elsewhere; and  
5=I would not come here again.

Overall party size was 3.2 and respondents spent an average of five hours at the site. One-way travel distance was about 30 miles and total trip expenses averaged \$36.40 for all lakes or projects. Respondents took an average of 21 trips to the site in a twelve-month period. On a five-point scale with one being poor and five being excellent, the sites visited by the respondents were rated as 3.7. Users' preferences for the areas visited were also rated on a five-point scale with one signifying a high level of preference and five representing a low level of preference. The overall rating of respondents was 2.3 on the five-point scale. Again, all trip-related characteristics reported in Table 2 exhibited a statistically significant difference at the ten percent level across lakes.

Respondents were also asked a series of questions to ascertain their attitudes toward day-use fees. The results strongly indicate that many respondents have very strong negative attitudes toward fees. For example, almost half (48.5%) of all respondents strongly agreed that they should not have to pay a fee to use the

Table 3. Socio-demographic and trip characteristics of Corps day-use visitors, by willingness to pay day-use fee.

Characteristic	Would Pay Fee	Would Not Pay Fee
Average Age (years)	40.3	40.0
Sex (percent Male)*	58.9	65.3
Household Size (people)	3.1	3.0
Education (years)*	13.5	13.0
Household Income (\$)*	38,600	32,800
Race (% caucasian)	87.5	89.4
Party Size* (persons)	3.3	3.0
No. of Hours spent at Rec. Area*	5.4	4.5
One-Way Travel Distance*	32.8	26.8
Total Trip Expenses*	\$29.80	\$25.33
Quality rating for site <sup>1</sup> *	3.76	3.61
Preference Rating for Area Visited <sup>2</sup> *	2.2	2.4
No. of Visits to Rec. Area in Last 12 Months*	16.6	27.3
Visited Lake Area in Last 12 months where day-use fee was charged? (% yes)*	26.8	12.2

<sup>1</sup> See Table 2. <sup>2</sup> See Table 2.

\* denotes a statistically significant difference in group means at the 10 percent level, two tail test.

Corps day-use areas. Responses to other fee-related questions verified this strong negative attitude. This finding, of course, has a potentially large impact on the revenue collected from a user fee. We now turn to the procedures used to estimate revenues.

**Revenue Projections.** The revenue portion of the study was designed on the assumption that both a daily per vehicle fee and an annual pass would be offered to visitors if a fee system was implemented. Consequently, the new fee system would present current visitors with three choices: pay the daily per vehicle fee; purchase the annual pass; or, pay neither fee and stop visiting the site. Respondents were presented these options in the following question:

There is legislation before Congress that would establish day-use fees at Corps of Engineer day-use areas, like the one where your vehicle was stopped. The Corps is interested in your views on recreation day-use fees. Suppose a recreation day-use fee was charged at the recreation day-use area where your vehicle was stopped, and at other similar Corps-operated day-use areas nationwide. If the fee was \$\_\_\_\_\_ per vehicle per day, or \$\_\_\_\_\_ per vehicle for an annual pass that would allow you to use all the day-use areas located on this lake for one year, which option would you personally choose? (please circle one number)

1. I would pay the per-vehicle per-day fee
2. I would purchase the annual pass
3. Neither -I would not visit Corps day-use areas anymore

Fee levels ranging from one to five dollars for the daily fee and from \$10 to \$100 for the annual pass were written in the appropriate spaces prior to mailing the surveys.

Responses to the fee question were analyzed to determine how the introduction of a fee system would impact different subgroups of current visitors. A comparison of users who self-selected the "neither fee" option and those who chose one of the two fees is shown in Table 3. It should be noted that over 40 percent of all respondents indicated they would not visit the Corps areas if a fee was charged.

No statistically significant difference exists in the two groups in terms of age, household size, and the percent minority group members. The latter finding is particularly important, as one of the objectives of the fee study was to determine whether the implementation of a fee system would disadvantage current minority users more than non-minority users.

Significant differences do, however, exist for all other variables in Table 3. The group that selected the "neither fee" option has a higher percentage of males, a lower level of education, and a lower income level. The latter difference is especially important in that one of the questions to be addressed in the study is whether a fee system would discriminate against low-income users.

In terms of trip-related variables, those respondents who indicated they would no longer visit the site with a fee system took over 60 percent more trips during the last twelve months than their counterparts who would pay one of the two fees. One would think that this group would opt for the purchase of the annual pass. However, this was not the case.

Differences in other trip-related variables are more consistent with expectations. Respondents who were unwilling to pay a fee spent less time at the site, reported lower quality and preference ratings for the areas visited, and a smaller fraction had paid a fee to use a day-use area located on a lake during the last year. The latter variable may partially explain the aversion to fees expressed by the "neither fee" group. Historical experience in paying fees is often a significant factor in explaining people's attitudes toward fees. Responses to the fee question also varied significantly across the six projects, thereby suggesting that regional differences in response to fees exist.

Responses to the three-choice fee question were also used to estimate the revenue that could be collected at the six projects if a fee system was implemented. A polychotomous choice selectivity model was used to obtain the information needed to estimate revenues at each lake. This model involved two steps. In the first, a multinomial logit model is used to partition respondents into three categories: those predicted to pay the daily fee; those predicted to pay the annual pass fee; and those predicted to pay neither fee. The dependent variable in the multinomial logit model is limited to three values corresponding to the three choices available to respondents: "zero" if the respondent

indicated they would not pay either fee; "one" if the respondent chose the daily fee option; and "two" if the respondent chose the annual pass. Independent variables are used to "explain" the observed differences in the responses to the fee question.

This initial step in the polychotomous choice selectivity model provides an estimate of the number of people in the sample who would choose the annual pass option at alternative daily and annual fee levels. Revenue projections from the sale of annual passes are calculated by multiplying the number of people in the sample who would purchase the annual pass at alternative prices. The revenue collected from the people in the sample is then expanded to the population using appropriate expansion factors.

In the second step, data from the respondents who chose the daily-fee option are used to estimate a demand equation describing the number of visits that would be made to the site at alternative daily fee levels. Ordinary least squares is used to estimate the demand equation, and the statistical results obtained in the first step are used to correct for the sample selection bias. The dependent variable is the number of visits respondents said they would have made during the last twelve months if the fees specified in the fee question had been charged.

The estimated demand model provides a price-quantity relationship between the daily fee and the number of visits that would be made by respondents who chose the daily-fee option. This price-quantity relationship is used to estimate the revenue that would be collected through the daily fee from the sample respondents at different fee levels. Revenues are then projected to the population using appropriate expansion factors. Finally, revenues from the daily fee and annual pass fee are summed to estimate the total revenue that could be collected.

The total revenue projections for the six projects at alternative fee levels are shown in Table 4. The estimates are in matrix form, with the rows representing annual pass fee levels ranging from \$10 to \$50 in \$10 increments, and the columns representing alternative daily fee levels ranging from one to five dollars, in one-dollar increments. Each cell in the matrix represents the projected revenue associated with the annual pass fee and daily fee indicated for the intersecting row and column. For example, a daily fee of three dollars and an annual pass fee of \$20, yields an estimate of \$1.53 million in total revenue.

Table 4. Projected revenue at alternative fee levels for the six Corps projects (\$1,000).

		Daily Fee				
		\$1	\$2	\$3	\$4	\$5
Annual Fee	\$10	899	1,033	988	934	914
	\$20	1,124	1,494	1,532	1,438	1,379
	\$30	1,124	1,534	1,624	1,457	1,302
	\$40	1,045	1,548	1,548	1,320	1,038
	\$50	1,051	1,615	1,705	1,496	1,090

Projected revenues vary from a low of about \$900,000 at the \$10 annual fee and \$1 daily fee and the \$10/\$3 combination, to a maximum of \$1.7 million at the \$50/\$3 fee combination. However, the fee combination of \$30/\$3 produces almost as much revenue--\$1.6 million. Furthermore, 14 of the 25 fee combinations result in projected revenues of more than \$1.3 million. Hence, the Corps has some flexibility in setting the fee levels without incurring large losses in revenue. Given the negative attitude of users toward fees, opting for a lower initial fee combination and sacrificing some revenue may be a prudent policy to reduce visitor dissatisfaction and complaints caused by the new fee system.

It is important to note that the revenue patterns in Table 4 is the result of a complex array of factors, including the total number of vehicles entering the designated fee areas in 1992, expansion factors, user's attitudes toward fees and the percent of respondents categorized in the "daily fee", "annual pass" and "neither fee" options by the multinomial logit model. The rate at which

respondents convert to annual passes as the daily fee increases is another important factor, as is the rate at which users convert to the daily fee as the annual pass increases in price. Finally, the rate at which users convert to the "neither fee" option as both the daily fee and annual pass increase in price is important.

In Table 5, "naive" revenue projections are shown for the various fee levels. These projections were calculated on the naive assumption that all visitors would continue to use the site after the fee was implemented, and that they would take the same number of trips as before the fee system. Whether visitors would choose to purchase an annual pass or a daily pass was determined by choosing the least-cost alternative. For example, if the fee combination was \$20/\$2, and a visitor took ten or fewer trips, it was assumed the visitor would purchase the daily pass each trip. On the other hand, if the visitor took more than ten trips, it was assumed that the day user would purchase the annual pass at that fee combination.

Table 5. "Naive" projected revenue at alternative fee levels for the six Corps projects (\$1,000).<sup>a</sup>

	Daily Fee					
	\$1	\$2	\$3	\$4	\$5	
	\$10	1,395 <i>(64%)</i>	2,009 <i>(51%)</i>	2,286 <i>(43%)</i>	2,389 <i>(39%)</i>	2,843 <i>(32%)</i>
<b>Annual Fee</b>	\$20	1,700 <i>(66%)</i>	2,790 <i>(54%)</i>	3,417 <i>(45%)</i>	4,018 <i>(36%)</i>	4,520 <i>(31%)</i>
	\$30	1,839 <i>(61%)</i>	3,146 <i>(49%)</i>	4,099 <i>(40%)</i>	2,926 <i>(30%)</i>	5,595 <i>(23%)</i>
	\$40	1,897 <i>(55%)</i>	3,401 <i>(46%)</i>	4,511 <i>(34%)</i>	5,579 <i>(24%)</i>	6,178 <i>(17%)</i>
	\$50	1,838 <i>(57%)</i>	3,547 <i>(46%)</i>	4,780 <i>(36%)</i>	5,930 <i>(25%)</i>	6,974 <i>(16%)</i>

<sup>a</sup>Numbers in parentheses represent model revenue projections as a percent of naive projections.

The naive projections range from a low of \$1.3 million to almost \$7 million. More importantly, the actual projections are much lower than the naive projection. In fact, in the best of circumstances, the actual projection is only about two-thirds of the naive projection. In the worst case, the actual projection is only 16 percent of the naive projection. These comparisons clearly indicate the importance of considering visitors' attitudes toward fees and their stated reaction to them when projecting revenues from fees. The naive projections usually will be much higher than actual revenues. We believe the procedures used in this study are potentially very useful to recreation managers who must project revenues from recreation user fees.

## THE DEVELOPMENT OF A RECREATIONAL LAND CLASSIFICATION SYSTEM

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The New York State Office of Parks, Recreation and Historic Preservation has had a land classification system in place since 1972. This system was developed during the creation of the first Statewide Comprehensive Outdoor Recreation Plan. This system has become the backbone of the Park Master Planning Process. During the past few years the New York State Park System has undergone serious evaluation. This evaluation determined that the Parkland Classification System is out of date and no longer addresses today's needs or issues. This paper attempts to illustrate how the New York State Office of Parks, Recreation and Historic Preservation (OPRIIP) is approaching the redesign of their Recreational Land Classification System.

### The Purpose of a Recreational Land Classification System

Since New York first acquired the Niagara Frontier to protect it from the threat of development and obtained Washington's Headquarters in Newburg, the state's park system grew faster than ever imagined. Today the park system encompasses 150 parks, 35 historic sites (many of which are on both the State Register of Historic Places and the Federal Register of Historic Places), 19 boat launching facilities, 6 canal parks, 13 marinas, 14 Urban Cultural Parks, hundreds of miles of parkways and hundreds of miles of trails.

These parks and sites contain some of New York's most magnificent natural features. For example, within the park system there are 160 lakes and ponds, hundreds of acres of wetlands, miles of coastal shorelines, mineral springs, gorges, sand dunes and mature forests. The U.S. Geological Service has identified 67 parks with important and unique geologic features and the National Heritage Trust has also identified 45 parks that contain rare plants, animals and exemplary natural communities.

Through a Resources Steering committee, four main purposes of a classification system were identified: 1) to group parks and historic sites with similar natural, cultural and recreation resource characteristics; 2) to provide broad management, protection and development directions; 3) to provide guidance for the development of management and master plans; and 4) to inform the public/user as to what type of experience they may expect at a specific park or site.

### The State Land Recreational Planning System

The State Land Recreational Planning System is a management system designed to meet the changing recreational needs of the public as well as protecting and preserving the natural resources unique to each site. It is a system that responds to identified public needs and involves public input throughout the planning and implementation process. Figure 1 shows how the Land Classification System (LCS) fits into the planning process (Figure 1).

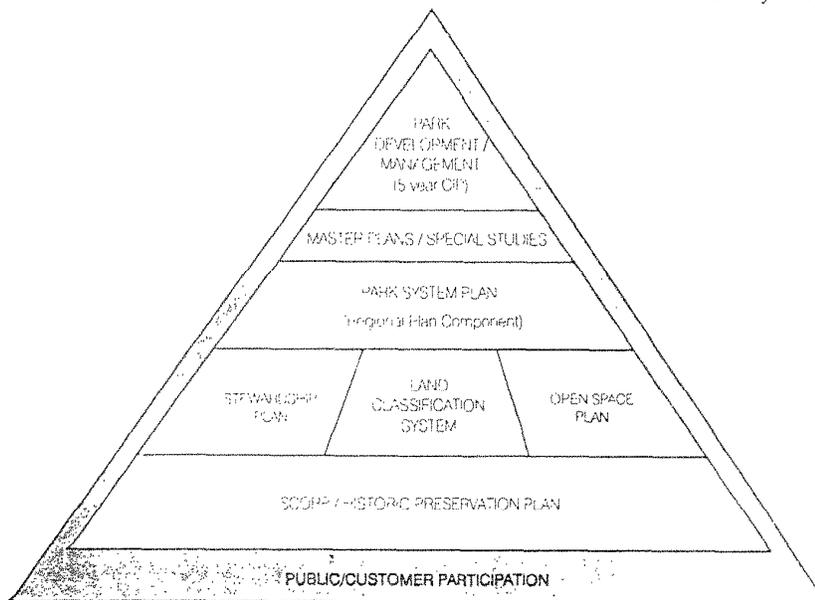


Figure 1. OPRIIP's planning system.

At the base of the pyramid is the Statewide Comprehensive Outdoor Recreation Plan (SCORP). The SCORP is a broad document that provides a vision for recreation in New York State over a five year period. This plan encompasses the recreation industry in the entire state and reaches beyond the scope of the New York State Park System.

Within the recreational planning system, the Conserving Open Space in New York State plan, OPRIIP's Fostering Environmental Stewardship report and the Land Classification System provide more specific policy directions to guide OPRIIP's planning system. The "Open Space Plan" defines the needs and outlines some strategies for conserving open space lands. The plan was

devised through the cooperation of both the Department of Environmental Conservation (DEC) and the Office of Parks, Recreation, and Historic Preservation (OPRHP) as authorized under the provisions of section 49-0207 of the Environmental Conservation Law (NYS DEC and OPRHP, 1992).

The report, Fostering Environmental Stewardship, addresses the issue, not only, of the deterioration of the facilities and structures at state parks but also the loss and abuse of natural resources within the state parks. The "Stewardship Plan" provides a brief evaluation of the park system and lists over 100 management strategies and recommendations to "... inventory, assess, protect, or enhance the natural, cultural, scenic, and recreational resources of New York's system of state parks and historic sites" (NYS OPRHP, 1993).

The LCS categorizes the state parks according to the type of site (i.e. multipurpose, linear, historic or boat launch, etc.), the level of development, the purpose set forth in the enabling legislation, the available facility/activity development, and levels of use intensity. Under this system, similar state lands are grouped together. This approach allows for developing common management directives for lands of the same class. All of these components are used as a basis for developing OPRHP's Park System Plan. OPRHP's Park System Plan is a general plan that focuses on the entire park system and develops concepts, goals and objectives for the park classes.

OPRHP's Master Plans are park/site specific plans and will eventually use guidelines and management strategies identified in the Park System Plan. These plans define hands-on management actions that serve to satisfy the objectives, goals, concepts, and ultimately, the vision for recreation in New York State. Specific policies are identified, use and resource analysis is conducted, alternative management actions are considered and finally, a preferred alternative is selected.

The Capital Investment Plan outlines projects (i.e. the development or rehabilitation of facilities) that are scheduled to be started or completed within a five year time block. Ultimately, the public experiences the results of this planning system.

### Land Classification System

The LCS has been a component of the New York State Parks Planning Process and the Statewide Comprehensive Outdoor Recreation Plan (SCORP) since its development in 1974. The proposed system uses various aspects of all OPRHP recreation lands such as level of development, physical capacity, environmental constraints, and other management related data, to identify appropriate activities and classify park types so that appropriate management directives can be developed.

The proposed LCS provides a more detailed and a clearer set of parameters for each classification. This includes the incorporation of new activities and facilities categories. Since every OPRHP park/site has distinctive features and a particular level of development, the categorization according to development intensity (High, Moderate, Low) introduces a new variable that is to be incorporated in the evaluation of each area. Also, two other activity indicators, "Allowed" and "Not Allowed", were added. The "Allowed" indicator permits the identification of activities that take place on parks/sites but do not require built facilities, while the "Not Allowed" level identifies activities that are expressly prohibited by either policy or legislation.

The system has been expanded to include new land categories: Underwater sites, Urban Cultural Parks, Interpretive areas and DEC land categories. Finally, within the revised classification system, the classification of each area is clearly identified. The classification represents the overall evaluation of the area based on natural/cultural resources, activities and facilities. The park/site may be zoned through the master planning process to reflect areas that require different types of management such as the identification of "preserve areas" within a park classified as a "Scenic" or "Recreation Park" (Figure 2).

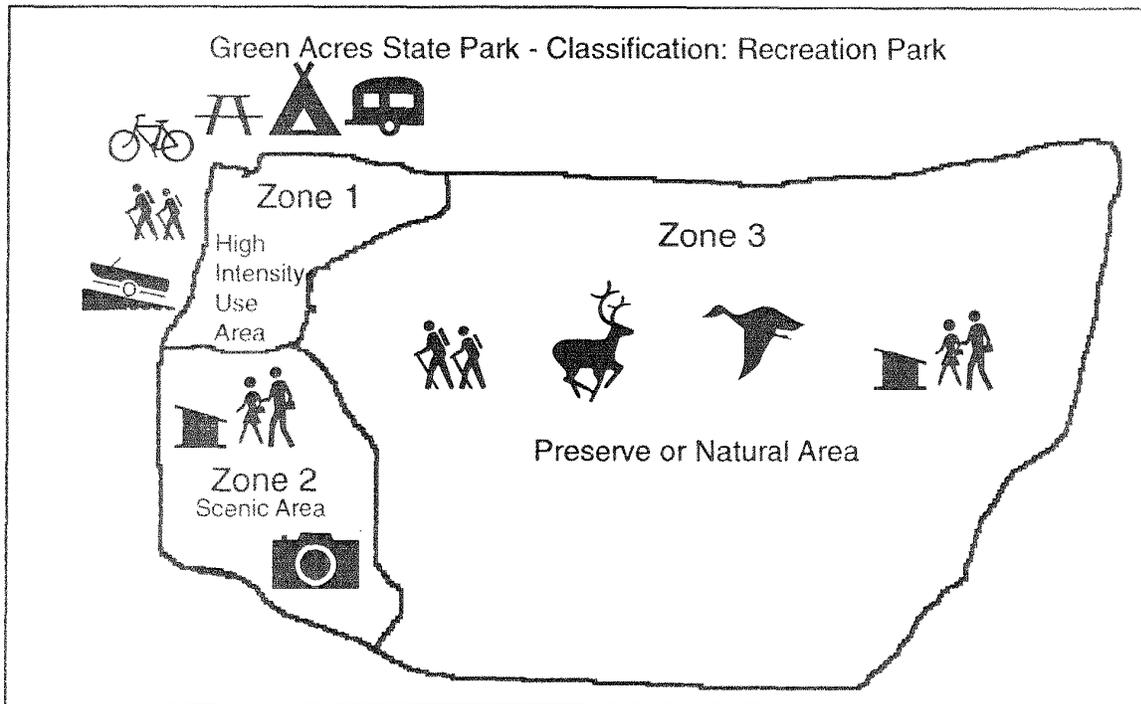


Figure 2. An example of park zoning.

**Classification Framework:**

**The Conceptual Matrix**

The initial classification system was based on natural resource, recreation facility and operational information that existed at the time of its development in 1974. The system is part of a dynamic process that evolves as the system is continuously refined and more information becomes available. The initial analysis grouped parks and sites with similar characteristics and provided a primary form of land capability analysis to ascertain what intensities of use a particular area or park can support (OPRHP, 1980). The 1974 classification system did not indicate areas where development should be totally prohibited or encouraged but did indicate the overall natural constraints faced in park development or management.

The proposed classification system is based on the combination of natural and cultural resources, the major types of recreational activities and facilities and the levels of development for each park. The progression from areas of intensive development to areas of limited development shows the importance of the ecological attributes and the vulnerability of the natural and historic resources offered by the different recreational units. Each cell of the conceptual matrix implies a particular management strategy that allows appropriate public use by setting specific developmental guidelines (Figure 3).

		Parks & Land Resources	Water Access	Historic	Linear Systems	Underwater	Environmental Education
LEVELS OF DEVELOPMENT	Intensive Development	Metro Park	Marine Park	Historic Site	Parkway	N/A	N/A
		Recreation Park		Urban Cultural Park	Linear Park		
	Low Intensity Development in Natural Surroundings	State Campground	Boat Launching Site	Historic Park	Canal Park	Historic Park	Fish Propagation Facilities
		Scenic Park			Recreationway	Park	Interpretive Environmental Education Centers
	Primitive	Management Areas	Carpool Boat & Fishing Access (Includes stream easements)	Historic Preserve	Primitive Trailway	Underwater Historic Preserve	Environmental Education Summer Camps
		Forest Preserve					
	Park Preserve						

Figure 3. The conceptual classification matrix.

By combining the major types of recreational activities and the levels of development intensity for each park, the matrix describes park categories that are sufficiently similar to maintain relatively uniform management analyses of potentials and constraints.

The levels of development in which the state parks and recreation areas were classified remains the same as those used in the 1983 SCORP (OPRHP, 1983).

**INTENSIVE DEVELOPMENT:** is associated with those properties compatible for high intensity, concentrated use. Facilities may be provided for indoor and outdoor activities; these and other man-made structures are predominant.

**LOW INTENSITY DEVELOPMENT:** is associated with those properties that are developed at a relatively low intensity in such a way to allow public use in natural surroundings.

**PRIMITIVE:** are those areas containing fragile ecological or cultural resources that must be protected through appropriate but limited public use.

**Type of Activity/Facility**

The proposed classification system also uses the existing four categories according to the type of activity/facility offered by the unit:

**PARKS & LAND RESOURCES (P):** open space areas utilized in various degrees for recreation and environmental purposes.

**BOATING (B):** facilities with a focus toward boating activities and its related uses.

**HISTORIC (H):** site with historical significance that are primarily managed for cultural interpretation or preservation.

**UNDERWATER:** aquatic areas of good water quality with geological and/or historical significance.

**ENVIRONMENTAL EDUCATION (E):** sites having significant interpretive and educational potential, managed primarily for public visitation.

**LINEAR SYSTEMS (R):** recreation ways, parkways, trails, movement corridors which link recreation, cultural or open space areas either to population centers or to other recreation/cultural areas.

To further refine the classification system, development levels were established for the activity/facility categories within each classification. The intensity levels include:

**HIGH INTENSITY (H):** Areas or activities within the park/site which require extensive or a higher level of development of indoor/outdoor facilities and programs ( i.e. swimming pool complexes, high use developed beach areas, band shells, court game areas, campsite development with full hookup and electric, marinas, etc.)

**MODERATE INTENSITY (M):** Areas or activities within the park/site which require a moderate level of development of indoor/outdoor facilities and programs (i.e. smaller developed beach areas with basic supports facilities, campsite development with basic support facilities or paved boat launching sites).

**LOW INTENSITY (L):** Areas or activities within a park/site which require no or a limited level of development of indoor/outdoor facilities (i.e. primitive campsites, natural beaches with limited support facilities or unimproved boat launching sites).

**ALLOWED (A):** Activities that are low impact but may vary in type and level. There are no or limited developed and support facilities associated with the activity (i.e. hunting).

**NOT ALLOWED (X):** Activities that have been specifically defined not to be permitted within a particular area.

Through an agency "Park Planning Steering Committee," comprised of park professionals from each of the regions and appropriate bureaus, the recreation activity criteria for each classification was clarified and revised. A list of activities along with a level of development measure was created. However, not all the activities identified for a classification may be appropriate or desired for a particular park or site (Figure 4).

Once the type of activity is combined with the level of development, 23 subcategories emerge in the proposed classification system. The gradient from high intensity development to low intensity development within each general categorization denotes a new improvement to the classification system. An example is shown in Figure 5. The system, however, does not reflect the intensity of use a particular area or facility may experience. For instance, a low intensity developed area such as a canoe access area may receive a high level of use as compared to a paved boat launch site which may experience a low level of use. This is a factor of location and attributes which attract people.

The land use criteria for the proposed system gives a brief description of each classification, an overall level of development and a breakdown of the number of acres in built areas, managed areas or undeveloped natural areas (Figure 5).

PARK CLASSIFICATION

ACTIVITY / FACILITY	P-1	P-2	P-3	P-4	P-5	P-6	P-7	B-1	B-2	B-3	E-1	E-2	H-1	H-2	H-3	H-4	R-1	R-2	R-3	R-4	U-1	U-2	U-3	
DAY USE																								
PICNIC	H	H	M	H	L	L	L	H	M	L	M	L	H	M	L	H	L					L	L	L
PLAYGROUND	H	H	M	M				M								H								
COURT	H	H	M	M												H								
FIELD	H	H	M	M				L								H								
GOLFING		H		H	L											H								
NON-MOTORIZED TRAILS																								
Hiking	H	H	H	H	L	L	M	L			M		M	M	H	M								
Biking recreational	H	H	M	H	L	L	L	L						L	L	H	M	M	M	L				
mountain		H	M	M	L	L	L									H	M	M	M	L				
Nature	H	H	H	H	L	L	H	L			M					H	M	M	M	L				
Equestrian		H	M	H	L	L	L						M	L			M	M	M	L				
Horse Carriages		H	M	H			L									L	M	M	M	L				
MOTORIZED TRAIL																								
ATV						X											L	L	L					
Trail bikes					L/X												L	L	L					
4WD					L/X																			
ROCK CLIMBING		A	A	A	A		A																	
HUNTING		A	A	A	A	A	A				X	X												

Figure 4. The compatible activities/facilities matrix.

**Applying the Land Classification System**

The existing park and site classifications were then reevaluated using professional staff knowledge of each park and site. Based on the revised activity and land use criteria, several parks were reclassified. Some parks were reclassified in a classification that allows a higher level of development, while others received classifications that permitted lower levels of development. In most cases, the acreage of land uses and the significance and level of protection of a park's natural and cultural resources did not change. The system and individual park and site classifications will continually undergo additional refinements through the master planning process and as more natural and cultural resource information is developed.

The Park Steering Committee identified additional options to be considered in the further refinement of the system. The proposed system is based on a single classification for a park or site. An alternative would be to have a dual classification system in which there would be separate classifications for natural and cultural resources and recreation resources. This would provide additional guidance in land use, development and management decisions and strengthen the concept of establishing zones within parks and sites.

The central concept of the classification system lies in the progression from classification of park/site types and the identification of functions to the specification of appropriate management practices. The classification system is intended to provide direction and guidance for making land use decisions while retaining the flexibility to permit individual evaluation in specific park/site sub-zones. It is recognized that good planning and environmental review principles must remain in force relative to these issues. The system is intended to support such rational planning and environmental assessment activity, not preclude it.

In the ultimate application of the entire classification system, "gray" areas will always exist. This is due to the uniqueness and the character of each park and site. Even though the classification system will provide overall guidance, individual consideration for the determination of development, protection and management will occur at the park and site level.

The updating process of the Land Classification System responds to the necessity of getting more detailed information of the natural and cultural resources statewide and under OPRHP's responsibility. As more detailed information is developed, the classification of the recreational units can be accurately reevaluated.

PLANNING CATEGORY	RESOURCE CHARACTERISTICS	-----USE CHARACTERISTICS-----			
		DESIGNED LEVEL OF USE	% BUILT AREAS	% MANAGED AREAS*	% UNDEVELOPED NATURAL AREAS
<b>METRO PARKS P-1</b>	Located in urban, industrial or suburban surroundings with man-made architectural treatment of the environment.	High	0 to 75	25	0 to 75
<b>RECREATION PARK P-2</b>	Natural surroundings in suburban or rural areas. A mix of natural and developed areas, significant natural areas not essential.	High	0 to 15	0 to 100	0 to 100
<b>STATE CAMPGROUNDS P-3</b>	Primarily in rural setting. A mix of natural and developed areas, significant natural areas not essential.	Moderate	0 to 10	0 to 80	20 to 100
<b>SCENIC PARKS P-4</b>	Natural setting, limited development, scenic attractions within urban, suburban or rural areas. A mix of natural and developed areas with significant scenic features.	High	0 to 5	0 to 50	50 to 100
<b>MANAGEMENT AREAS P-5</b>	Primarily wooded or wetland areas; rural natural setting; limited or no development; offers significant recreation and wildlife observation opportunities.	Low	0 to 15	0 to 5	85 to 100
<b>FOREST PRESERVE P-6</b>	Natural, forested areas; low to moderate development of facilities usually related to compatible activities; recreation opportunities range from low-impact, wilderness activities to limited motorized activity	Low	0 to 5	0 to 5	95 to 100
<b>PARK PRESERVES P-7</b>	Natural areas, few developed facilities within urban, suburban or rural areas. Could have salt marshes, wetlands, bogs, dunes, unusually steep topography, flood prone areas, or other significant environmental resources.	Low	0 to 5	0 to 15	85 to 100

Figure 5. Land use criteria for the proposed land classification system.

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## PEOPLE'S PERCEPTIONS OF MANAGED AND NATURAL LANDSCAPES

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Research was undertaken to identify the opinions of what people saw in slides of managed and unmanaged landscapes. Most people were attracted by natural landscape features. Clearcuts were reported less frequently than roads, but dislike of them was more than 30 percent greater. Natural openings, bare areas, and sparse tree cover also were disliked.

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### Introduction

Visitors to wildland areas of the United States see an untold variety of natural and manmade features that comprise our National landscape. But, what do they really see, and do they express their feelings about their perceptions in some meaningful way? People reportedly endow meaning to landscapes (Lynch 1960; Lee 1976). Landscape architect Garrett Eckbo (1969) said, "the physical landscape is visual; the social landscape is verbal." Thus, it is through words that people express what landscapes mean to them and their concern for what is seen. Verbal expressions of what people see in landscapes provide not only clues to the meanings they assign to landscapes, but also their concern for management and its influence on visual quality. Thus, verbal expression may offer managers indicators of how the public may react to natural resource management and suggest management alternatives that are sensitive to the desires of the viewing public.

Efforts to assess public perceptions and concerns about the landscape and its management led to the development of sensitivity levels in the Visual Management System used by the Forest Service to plan management within visual constraints. Presumably, sensitivity levels measure viewer interest in the scenic quality of landscapes by determining the frequency of visitor travel along highways. However, counting people cannot be construed as an expression of public interest or concern for what may have been seen in landscapes.

A study, completed in 1989, was designed to provide some measure of public sensitivity or concern for landscapes and their management. One objective was to identify distance thresholds at which objects of a known size could be detected and identified (Magill 1990). In addition, opinions were sought about objects and management actions that people saw as indicators of concern for landscapes or to suggest how to develop such indicators (Magill 1992). This paper describes people's perceptions and opinions about natural and managed landscapes.

### Methods

Respondents were shown color slide sets of various landscape components, structures, and management actions from throughout the western United States. Slides were randomly distributed into 8 slide shows of 30 slides each. During shows, respondents completed a questionnaire providing brief descriptions of the two objects, in order of importance to them, that attracted their attention in the slides. Also, they indicated whether they liked, disliked, or were indifferent to the objects seen. Thus, all objects reported by respondents were natural objects, manmade objects, or management actions that included trees, forests, cuttings, clearings, and regeneration of trees.

### Results and Discussion

The majority of respondents were long-term suburban residents of primarily California. Forty-one percent of them were professionally trained persons and another 29 percent were retirees. Eighty percent had attended college, and 73 percent had family gross annual incomes of \$25,000 or more. Two-thirds of the respondents were male, and most recreated on wildland areas 3 to 10 times per year.

The 788 respondents reported seeing 154 objects or conditions as being most important to them in the slides of managed and unmanaged areas. Among the objects were 30 vegetative conditions such as brush, forest stands, woodlands, forest groves, tree growth, sick trees, and vegetation.

According to psychologist M.D. Vernon (1968), people tend to focus attention on things having the greatest interest or importance to them while things of lesser interest are seen only peripherally. People also tend to be more interested in and assign more importance to natural landscape elements, such as forest stands and mountain ranges and peaks, in contrast with various management actions like roads and clearcuts (Magill 1990). These conclusions were fortified by analysis of specific terms used by respondents to describe the two most important objects or conditions they saw. Most people, in this study, were attracted by natural landscape objects seen in slides, regardless of management or lack of it. And, 79 percent of the responses were concerned with various combinations of trees, hills, valleys, mountains, vegetation, and other objects descriptive of natural landscape conditions.

### Forest Stands and Trees

Foremost among the favored landscape elements were "forest stands," which accounted for nearly 13 percent of the responses for scenes of managed and unmanaged landscapes. Forest stands were reported nearly 40 percent more frequently than any other natural object, and 81 percent of the responses indicated that they were liked. Forest stands contributed 23 percent of the responses associated with viewing scenes of regeneration, and 82 percent of those responses indicated that viewers liked the regenerating forests. For such sites, forest stands likely were reported in lieu of regeneration—probably because the term, "regeneration," may not be meaningful to most respondents. When the terms, "valleys," "hills," "mountains," or "peaks," were modified by forested, the locations that were described were liked more than other locations described by the unmodified terms. Clearly, forests are important visual components of our landscapes.

### Bare Areas and Brush Clearings

"Bare areas" rated among the 10 most frequently reported natural landscape elements, and according to a majority of responses (61 pct), they were disliked. As might be expected, "barren valleys," "bare hills," "bare mountains," and "bare peaks" were also disliked. Yet, if any of these features were described as forested, grassy, or green, they were liked. Two vegetative conditions may be related to perceptions of bareness. Landscapes that were reported as having either "no vegetation" or "no trees" also were disliked even more than bare areas. Apparently the respondents preferred seeing landscapes that supported trees or some other type of vegetation. Moreover, they disliked "sparse forests" (42 pct), "sparse vegetation" (53 pct), or "even-sized trees" (72 pct), while they preferred "green vegetation" (86 pct), "green valleys" (81 pct), "green hills" (80 pct), and "green mountains" (85 pct).

People saw brush clearings, done to favor tree growth, as "bare areas" or "clearcuts." In all likelihood, the activities were not identified as "brush clearings," because respondents may have been unfamiliar with that type of land management and with the terminology used to describe it. Similar arguments could be applied to type conversions for livestock or wildlife habitat improvement and to tree regeneration after timber harvesting, brush clearing, or burns. These misinterpretations suggest that better public understanding of natural resource management is needed. Gaining understanding may best be done by listening to people, learning how they want their resources managed, then

adapting management, if possible, for the benefit of the people and the resources. Accomplishing the job may not be easy. Resource managers have been reported to have difficulty with public interactions including a tendency to seek a change in public opinion, but not in their own management practices (Magill 1988).

### Tree Regeneration

Tree regeneration after timber harvesting was the subject of several scenes. Regeneration was the last of the 20 objects most frequently reported by respondents. People reported seeing "growth," "new growth," "tree growth," "young trees," "plantations," "farms" or "ranches," and "pastures." Any of these could be descriptive of regeneration, and all were liked. In general, most people looked at scenes of regeneration, but they reported seeing "forest stands."

Many areas that were fully stocked with regeneration were described as "clearcuts," "cuttings," "bare areas," and "logging"--all terms accurately described the sites being viewed. Either the respondents were unable to recognize the regeneration on such areas, or they simply failed to mention it. Regardless, when such scenes were perceived to involve timber harvesting, most were disliked (60 pct).

"Snags" and "dead trees" accounted for 5 percent of the responses of those who viewed scenes of regeneration, but opinions were

equally divided between liking and not liking them. Those that liked the snags and dead trees were among the members of professional societies and various conservation organizations. On the other hand, members of sportsmen's clubs and industrial associations tended to dislike dead trees and snags. Possibly, they associated them with fire prevention messages that identify snags and dead trees as contributors to the spread of wildfires, whereas the other groups saw them as beneficial to wildlife.

### Clearcutting and Other Timber Harvesting

Despite the public debate about management versus environmental protection on public lands in the United States, only two management actions were reported among the 22 most frequently reported objects for scenes of managed landscapes (Table 1). On lands where timber harvesting was in progress, "forest stands," "mountain ranges," "dome peaks," "meadows," "hills," and "bare areas" were reported even more frequently than clearcuts. However, in combination, "clearcuts," "cuttings," "clearings," "selection cuts," "partial cuts," "regeneration cuts," and "shelterwood cuts" accounted for a total of 6 percent of all objects reported on timberlands. The frequency of response was negligible for the last four cutting types. "Timber cuttings," unspecified as to type of cutting, were disliked, according to 64 percent of the responses, and "clearings," either tree cuttings or brush clearings, were disliked according to 51 percent.

Table 1--The objects most frequently reported for managed landscape and opinions of them.

Opinions of Objects Reported						
Objects Reported	Liked		Disliked		Indifferent	
	Percent	(n)	Percent	(n)	Percent	(n)
Forest stands	81.2	(3500)	3.3	(144)	10.0	(431)
Mountain ranges	78.3	(1999)	2.8	(71)	13.7	(349)
Dome peaks	78.8	(1791)	4.0	(90)	12.9	(292)
Roads	21.1	(391)	42.7	(791)	30.8	(570)
Hills	64.9	(927)	7.7	(110)	21.5	(307)
Meadows	72.3	(690)	6.8	(65)	16.4	(157)
Bare areas	11.0	(104)	61.5	(582)	22.0	(208)
Brush	46.9	(409)	17.8	(155)	30.0	(262)
Clearcuts	9.3	(77)	75.7	(630)	12.7	(106)
Color contrasts	68.8	(487)	12.1	(86)	14.1	(100)
Rocks	69.1	(447)	6.8	(44)	19.6	(127)
Lakes	88.6	(544)	1.8	(11)	4.4	(27)

Some managers may be surprised to learn that "clearcuts" were second to "roads" as the most frequently mentioned type of landscape management, especially considering the number of appeals and law suits concerned with timber harvesting. Furthermore, clearcuts were not the management action that was most disliked, though they were more frequently mentioned than the other actions that were disliked more (Table 2). Dislike of "overgrazing" and "poor management" was 10 percent greater

than for clearcutting. Also, respondents reported seeing "cuttings," "logging," and "clearings" after viewing scenes that actually contained clearcuts, but the frequency of responses was much less than for clearcuts as was the percentage that disliked them. Nevertheless, clearcuts accounted for over 3 percent of the responses for areas subject to timber harvesting, and 67 percent of the responses indicated clearcuts were disliked.

Table 2--Opinions of management objects on managed landscapes (ordered from most to least disliked)

Opinions of Objects Reported						
	Liked		Disliked		Indifferent	
Objects Reported	Percent	(n)	Percent	(n)	Percent	(n)
Overgrazing	2.0	(1)	89.9	(44)	4.1	(2)
Poorly managed	11.4	(5)	86.4	(38)	2.3	(1)
Clearcuts	9.3	(77)	75.7	(630)	12.7	(106)
Powerlines	4.1	(10)	68.9	(166)	20.7	(50)
Cuttings	11.5	(33)	68.3	(196)	16.0	(46)
Smoke or smog	14.5	(22)	67.8	(103)	9.2	(14)
Logging	16.8	(38)	61.9	(140)	11.9	(27)
Mircowave towers	7.1	(14)	59.7	(117)	28.6	(56)
Clearings	14.0	(34)	55.4	(134)	26.0	(63)
Mines	14.8	(18)	51.6	(63)	18.0	(22)
Ski areas	25.5	(51)	45.5	(91)	27.0	(54)
Roads	21.1	(391)	42.7	(791)	30.8	(570)

The intensity with which clearcuts were disliked was emphasized by respondents who reported seeing "clearcuts" in natural or unmanaged areas. However, the information collected did not identify specifically what was perceived as clearcuts. The size of whatever was seen possibly was small enough to have prevented accurate discrimination. Also, people may have reported various cuttings and clearings because their attention was attracted to natural openings, bare areas, or sparse tree cover that led them to report what they expected to see rather than what was seen (Vernon 1968). Regardless, reports of disliking clearcuts were 17 percent greater when people saw scenes of natural areas as contrasted with scenes of timber harvesting.

Membership in different social groups provided some insight into who liked or disliked clearcuts. Fifteen percent of the responses for timber harvest areas indicated a liking of clearcuts predominantly associated with people belonging to professional societies, industrial associations, and the unaffiliated. Fifty-three percent of the responses showed that members of industrial associations liked the scenes of clearcuts, while only 20 percent or less indicated that members of professional societies or the unaffiliated liked clearcuts. The strongest disliking, over 80 percent of the responses, was expressed by members of influential conservation groups. Even though a few members of

sportsmen's clubs indicated a liking for clearcuts, most responses (72 pct) showed nearly as much opposition as among conservation groups.

The unfavorable reactions to clearcuts or things perceived as clearcuts are in harmony with numerous appeals of forest plans and injunctions against logging that reflect public disenchantment with clearcutting. One might contend the data are too provincial to merit comparison with a nationwide public issue. However, the dislike associated with clearcutting, in this study, came from persons who viewed numerous scenes of clearcuts located in the States of California, Idaho, Montana, Oregon, and Washington. All are locations within the heart of the present timber controversy. Thus, the findings seem to support warnings that change in forest management is needed in the United States. Change is manifesting now as "ecosystem management," which is suppose to couch forest management in scientifically supported ecological principles at the landscape level. Thus, it is expected to create sustainable forests while providing a full range of tangible and intangible benefits. At this stage, according to Assistant Secretary of Agriculture James R. Lyons, ecosystem management may be "more art than science" (1993). While, it is gaining the support of many people, others view it with skepticism.

This paper described a different approach for evaluating public perceptions and opinions of managed landscapes. It told what a segment of the public saw in color slides of managed and unmanaged landscapes and identified what the respondents liked and disliked about the scenes. Thus, it provides support for some opinions managers may have had about public reaction to the negative influence of various land management actions. Ideally, the approach will provide managers with better understanding of public concerns for the visual impact of resource management practices on wild landscapes and make management more visually sensitive to public desires.

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**THE RELATIONSHIP OF RECREATION  
SPECIALIZATION TO THE SETTING  
PREFERENCES OF MOUNTAIN  
BICYCLISTS.**

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This study gathered information about mountain bike use and users on unpaved trails in a Raleigh, North Carolina park. Specifically, it attempted to determine if levels of recreation specialization were related to the setting preferences of mountain bike users. The results offered partial support for the existence of a relationship between recreation specialization and preferences for various setting attributes.

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**Introduction**

This study examined the setting preferences of mountain bikers for various off-road trail features. Specifically, this research looked at the different setting preferences reported by mountain bikers of different levels of activity specialization (Bryan, 1977 & 1979). Many different types of off-road trails are currently used by mountain bikers. Land managers and recreational planners, however, have limited knowledge of why mountain bikers choose to ride where they do. To understand why riders prefer certain trails, it is important to better understand their choices for various settings. With knowledge of these preferences, land managers will be better able to serve participants of this growing activity.

The increased popularity of mountain bikes has led to a greater presence of cyclists on unpaved trails and in backcountry areas. Near urban areas, cyclists often use local parks and undeveloped tracts of land for their off-road riding. The managers of these urban and suburban areas, however, are often wary of the presence of mountain bikers. Their cautiousness stems, in part, from fears that mountain bike use will increase user conflicts, erosion, and resource damage. These fears seem to be particularly pronounced near urban areas because parks and open spaces there are often heavily used. These fears and heavy use have led to many areas being closed to mountain bike use.

Lake Johnson Park in Raleigh, North Carolina is an example of an urban/suburban park that has become popular with mountain bikers. The 463 acre park is only 3 miles from North Carolina State University and has several large apartment complexes, numerous private homes, and a high school on its borders. It contains a combination of approximately seven miles of paved and unpaved trails which parallel the shore of a 148 acre lake. The trails most often used by mountain bikers are unpaved and lie along the southern edge of the lake. These trails offer bikers a variety of challenging rides that are easily accessible. However, the Raleigh Parks and Recreation Department has plans to pave certain trails presently popular with mountain bikers and is considering closing the unpaved trails in the park to mountain bike use.

The closure of Lake Johnson Park's unpaved trails to mountain bikers would displace these users to other areas, some of which already have or are considering having restrictions on mountain

biking. The Raleigh Parks and Recreation Department is aware of this fact, and is considering designating alternative areas for mountain bike use. At the present time, however, no research exists which identifies the preferences for various site attributes among mountain bike riders. The lack of such information poses a problem, as managers are not sure what types of areas would be most attractive to mountain bikers and how to best design the trails in those areas. If managers did know which specific site attributes were preferred by mountain bikers, areas which meet the needs of these users could be provided. If such areas were provided, the mountain bike community might be more inclined to obey restrictions and accept closures elsewhere. Previous research, however, indicates that participants in a recreational activity, are not homogeneous (Shafer, 1969). All mountain bikers are not likely to prefer the same settings for their riding. One variable that has been found to be related to setting preferences among recreationists is activity specialization (Williams and Huffman, 1986; Ewert 1985; Virden and Schreyer, 1988). If recreation specialization is related to the setting preferences of mountain bikers, such information would be an important consideration for planners attempting to provide suitable locations for mountain biking.

**Related Literature**

Mountain biking began in the mid 1970's in the hills of Marin County, California. Early riders started with beach cruisers and began to add components from road bikes. By adding multiple gears, wider tires, and cantilever brakes to beach cruisers, early mountain bikers found they could ride on the dirt roads and trails in the area. In 1982, the Specialized bicycle company introduced the Stumpjumper mountain bike, the first production mountain bike ever sold. With the introduction of this new bicycle, a new sport was introduced to the masses (Ker, 1991). Since that time, the number of mountain bike riders in the United States has risen to an estimated 25 million in 1992. Mountain bikes have become so popular that they now represent 81% of all bicycles sold in this country (National Off-Road Bicycle Association, 1992). The tremendous increase in popularity of this sport since the mid-70's has generated new challenges for land managers.

Unlike other outdoor recreation activities such as boating, hiking, and fishing, mountain biking has received little research attention. Existing studies have focused on backcountry areas and tended to examine user conflicts involving mountain bikers or resource impacts caused by mountain bikes. For example, two USDA Forest Service studies examined safety concerns related to mountain biking on the Santa Barbara Front trails in California. As part of the study, meetings were held with representatives from four primary user groups of the trails: hikers, equestrians, mountain bikers, and Sierra Club members. Although various problems and solutions were discussed, none were agreed upon. A subsequent survey of the users of the Front trails led researchers to recommend that no action needed to be taken with regard to limiting mountain bike access. Instead, they suggested that managers improve safety for trail users through increased signage and user education. Both studies also showed no increases in trail erosion rates due to mountain bikes (USDA Forest Service, 1987 & 1989).

A study by Seney (1990) on the relative impacts of hiker, horse, mountain bike and motorcycle use on trails showed that trail damage by mountain bikers was not significant. In a preliminary study on the effects of mountain bike, foot, and horse traffic on exposed soil and soil compaction, McEween (1992) concluded that horse and mountain bike traffic appeared to show higher patterns of erosion than those of hikers in Ohio's Shawnee National Forest. The study also found that the impacts of horses and mountain bikes appeared to be very similar. Watson, Williams and Daigle (1991) looked at the extent of conflict between mountain bikers and hikers in the Rattlesnake National Recreation Area near Missoula, Montana. They compared hikers and bicyclists in terms of environmental meaning, perceptions of similarity, and conflict. The findings indicated that hikers generally expressed greater feelings of conflict than bicyclists. The conflict expressed, however, did not always affect

recreational experience or lead to specification of objectionable behavior. The findings did suggest that techniques, such as user education, could be used to reduce conflicts among area users. They found that cyclists considered themselves more similar to hikers than vice versa and suggested that this might be due to the fact that some bicyclists saw themselves as hikers who were using bicycles to gain quicker access to backcountry areas. The study also speculated that less specialized bicycle riders and hikers did not go into certain areas of the Rattlesnake National Recreation Area until they had developed a higher level of specialization and, therefore, a greater appreciation for the environment.

Most recently, Hollenhorst, Schuett & Olsen (1993) examined the characteristics, preferences, and attitudes of mountain bikers using national forests in West Virginia, California, and Texas. Data for the project was gathered using on-site surveys and focus group interviews. They found that mountain bikers in the national forests tended to be young, highly educated, affluent males from urban areas. "Mountain bikers overwhelmingly preferred off-road conditions, spending approximately 68% of their time on trails and abandoned roads" according to the authors (p. 26). A majority (66%) of respondents were day visitors and many reported participating in related activities such as day hiking, car camping, backpacking, and photography while visiting national forests. Mountain biker's attitudes and preferences were also examined. Although riders expressed an interest in taking chances, they did not perceive mountain biking to be dangerous. The three top reasons for mountain biking were found to be: Enjoyment/Fun/Love it; Physical/Exercise; and Nature/Environment. Access, impacts, and conflict were the most important issues and problems facing mountain biking in National Forests according to those surveyed.

The need for research on the characteristics of mountain bikers, conflicts with other users, commercial opportunities, and community development potential resulting from bicyclists has been recognized by two different USDA Forest Service Research Stations (Magill, 1992). These stations are currently beginning research which they hope will provide managers with information to guide planning and decision making regarding mountain biking. However, no past research has focused on urban or suburban mountain biking areas and very little is known about which site attributes mountain bikers prefer.

## Methods

A combination of on-site interviews and follow-up mail surveys were used to gather data for this study. Data collection took place during the months of January, February, and March, 1993. The data was collected during systematically scheduled trips of park trails designed to represent different times of day and all days of the week. One trip around the lake was made during scheduled weekdays and two trips (one morning and one afternoon) were made on scheduled weekend days to capture the far heavier use that occurred on weekends. During each trip, interviewers on mountain bikes attempted to intercept and interview every mountain biker on the unpaved trails. Interviews took approximately two minutes each and were used to gather basic use information and to acquire the user's name and address so a follow-up mail survey could be sent. A total of 54 interview trips around the lake were conducted. Each person interviewed was sent a copy of the mail survey within five days of their visit. A slightly modified Dillman approach was used which incorporated two follow-up mailings to nonrespondents (Dillman, 1978).

Level of activity specialization was the independent variable for this study. A series of five questions were asked related to this concept. These questions were: "How long have you been riding Mt. Bikes?," "How many times in the last 12 months did you ride your Mt. Bike off-road?," "When you ride your Mt. Bike off-road how long do you usually ride?," and "About how much is your mountain bike(s) and all your mountain bike equipment worth? (Please include all your mountain bike gear e.g., pump, helmet, car rack, clothes, etc.)." The fifth question asked "How would you rate yourself as a participant in the sport of Mt. Biking?" and was rated on a seven-point Likert-type scale where "1" indicated

"novice" and "7" indicated "expert." An additive index of activity specialization for mountain biking was created from these five questions by standardizing the responses to each using Z-score transformations (Virden, 1986). These Z-scores were then summed to form an index score for each respondent.

Mountain bikers' preferences for various setting attributes were used as the dependent variables for analyses. Preferences were operationalized by asking respondents to rate the desirability of various trail attributes in the mail questionnaire. They were asked, "Listed below are some of the characteristics that many people consider desirable for trails. Please consider each characteristic and circle the number that best indicates how desirable or undesirable it is to you when you select a place to ride." A list including 18 physical trail setting characteristics followed. After each attribute there was a nine point Likert-type scale ranging from "1" for "extremely undesirable" to "9" for "extremely desirable." The eighteen physical attributes to be examined were identified through interviews with members of local mountain bike organizations. These attributes included: "winding trail," "hills," "fast downhill sections," "natural surroundings," "technical sections," "single track trails," "rolling/undulating sections," "long distance," "technical descents," "log crossings/obstacles," "creek crossings," "rocky sections," "loop trails," "muddy sections," "bridge crossings," "long straight sections," "level grades," and "smooth trail surfaces." Descriptive statistics were used to describe the characteristics of mountain bikers surveyed and their preferences. Correlation analyses were used to examine the relationships between activity specialization and the preferences for each of the setting attributes.

## Results

A total of 141 mountain bikers were interviewed along the trails. Five users were under 16 years of age and were not mailed written questionnaires. Of the 136 mountain bikers who received mailed questionnaires, 102 (75%) responded. The characteristics of these users and their trail use are summarized in Table 1. In general, the mountain bike users of Lake Johnson Park were young, male, college-aged students who lived near the park. These users visited the unpaved trails approximately every week for about two hours and reported that convenience, closeness, and challenge were the main reasons for riding there. The users were predominantly single with incomes under \$20,000 and most rode their bikes from their homes to the park.

Table 1. Characteristics of trail users.

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Young males (mean age 23.2)
Average household income of less than \$20,000
Marital status = single
Ride at park frequently (mean 35.3 times in 12 months)
Average ride time of 2 hours
Live between 1 - 3 miles from the park.
Occupation = student

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In terms of activity specialization, the mountain bikers surveyed were varied. Most respondents were relatively new to the sport of mountain biking with an average of just over two years experience. Over 50% of the respondents had been riding mountain bikes for 24 months or less. There was a group (8.8%) of respondents, however, who had been riding mountain bikes for more than five years. In terms of self-rated skill, almost half (49%) of respondents rated themselves as above an intermediate level (> 4) on a 7-point scale. The average skill level of the respondents was 4.2, while the level of skill most frequently reported was 5 (38.2%). Only 5 (4.9%) respondents rated themselves as novices. On average the respondents reported that they had been mountain biking 68.6 times in the past twelve months. This represents more than one ride per week. All respondents reported that they rode for at least one hour every time they went mountain biking. The average time spent riding was over two hours (128.6 minutes) per outing. Only 6.0% of the respondents stated that they rode for three and a half hours or longer. The average dollar value of respondent's bike(s) and

equipment was \$1127.45. The highest value reported was \$7500. The responses to the above 5 questions were combined into an index to serve as the study independent variable. The resulting index had relatively high internal consistency as indicated by a Standardized Cronbach's Alpha reliability coefficient of .71 (see

Table 2). After Z-score transformation to control for differences in the ranges and units of each question, the Z-scores were added to form the final index of activity specialization. The index ranged from -7.06 to 11.60. The mean value for the specialization index was 0.02.

Table 2. Reliability analysis for activity specialization index.

Specialization Item	Item Mean (n=99)	Corrected Standard Deviation	Alpha Item-Total Correlation	If Item Deleted
Months of mountain bike riding experience	28.6	22.7	.46	.66
Self-rated skill level <sup>1</sup>	4.2	1.2	.58	.61
Rides taken in past 12 months	68.6	61.8	.52	.63
Duration of average ride in minutes	128.6	45.7	.32	.71
Dollar value of equipment	\$1,127.45	\$1,017.48	.44	.67
Standardized Item Alpha (Total Index)				.71

<sup>1</sup> Mean calculated based on categories of "Novice 1" (coded "1") through "Expert 7" (coded "7")

Respondents' preferences for each of 18 trail setting attributes were the study dependent variables and were measured on a 9-point scale where "1" was "extremely undesirable" and "9" was "extremely desirable." The 18 features are shown in order of decreasing preference in Table 3. All trail attributes which received a mean score greater than "5" on the 9-point scale were classified as "desirable" while those attributes with means less than "5" were considered "undesirable." When ranked, 15 of the 18 trail attributes were found to be desirable and the remaining 3 undesirable.

The most desirable trail attribute according to respondents was the presence of "winding trail" with a mean score of 8.1. "hills," "fast downhill sections," and "natural surroundings" all received mean scores of 7.9, indicating that these features were very desirable as well. The respondents rated features such as "log crossings/obstacles," "creek crossings," "rocky sections," and "muddy sections" as somewhat less desirable with scores ranging between 7.1 and 6.1. The only feature which drew a near neutral (5) response was "bridge crossings" with a mean of 5.5. The three features which received undesirable scores (means < 5) from the respondents were, "long straight sections," "level grades," and "smooth trail surfaces." These features received mean scores of 4.4, 4.3, and 4.2, respectively. Features that described the technical aspects of the trail ("technical descents," "creek crossings," "rocky sections," "log crossings," etc.) were ranked lower than features describing the trail itself ("winding trail," "hills," "natural surroundings," "single track," etc.).

The purpose of this study was to determine if there was a relationship between the level of activity specialization and the preferences for various setting attributes among mountain bikers. This relationship was examined separately for each of the 18 attributes using correlation analyses. The results of these analyses are presented in Table 3. Level of specialization was significantly (.05 level) related to preferences for six of the trail attributes. Specialization was positively and significantly related to preferences for "fast downhill sections," "technical sections," "single track trails," "technical descents," and "log crossings/obstacles." Preferences for "level grades" were negatively and significantly related to level specialization. The relationship of specialization and preferences for "muddy sections" was also negative and approached significance (p = .054).

## Discussion

This study found substantial mountain bike use at Lake Johnson Park. The finding that most users were young, male, college-aged students who lived near the park was not surprising. However the finding that users visited the unpaved trails more than once a week on average was not expected. It appears that the heavy mountain bike use at this park is due more to a small core of heavy users than to a large population of infrequent visitors.

The preferences for the various setting attributes provided an interesting look at the likes and dislikes of mountain bikers. Winding trails, with a mean score of 8.1 on a 9-point scale, was the feature Lake Johnson Park mountain bikers preferred the most. The thrill of turning and constantly changing direction seemed to be very appealing. At Lake Johnson Park, the unpaved trails wind constantly along the lake's shore, in and out of trees, and up and down hills. "Hills," "fast downhill sections," and "natural surroundings" were nearly as desirable (7.9) for riders at the park.

When a trail winds and is characterized by as many obstacles and challenges as the unpaved trails at Lake Johnson Park, the abilities of even the most skilled riders are tested. The specialized riders at Lake Johnson Park also seemed to prefer the challenge and convenience of the park. This preference for challenging areas helps explain why "single track trails", which are narrow one lane paths, were rated so high (7.6). "Single track trails" typically contain features such as "hills," "technical sections," and "fast downhills," which, when combined with "winding trails," definitely provide specialized riders with the type of terrain which challenges and tests their skills. As mountain bikers become more skilled, the ability to handle varying terrain increases. This fact was supported by responses to open-ended questions about why the respondents ride mountain bikes and why they ride at Lake Johnson Park. The responses to both these questions indicated that challenge was important. Additionally, Lake Johnson Park provides challenging terrain which is conveniently located. Significantly, the only other local areas (Falls Lake and Schenck Forest) which provided these types of desirable features have been closed to mountain bikers.

Table 3. Preferences for trail attributes and Pearson correlation coefficients between the specialization index score and the importance of trail attributes.

Attributes	Mean <sup>1</sup> Preference Score	Standard Deviation	Two-tailed Pearson r	probability	n
<i>Desirable Attributes</i> <sup>2</sup>					
Winding Trail	8.1	0.9	.149	.150	101
Hills	7.9	1.2	.179	.082	101
Fast Downhill Sections	7.9	1.3	.312	.002	101
Natural Surroundings	7.9	1.4	.044	.670	101
Technical Sections	7.8	1.3	.298	.004	101
Single Track Trails	7.6	1.6	.391	.000	101
Rolling/Undulating Sections	7.5	1.2	.039	.710	101
Long Distance	7.4	1.3	.141	.174	101
Technical Descents	7.4	1.5	.353	.000	101
Log Crossings/Obstacles	7.1	1.8	.249	.014	101
Creek Crossings	7.0	1.	-.097	.350	101
Rocky Sections	6.8	1.7	.013	.900	101
Loop Trails	6.7	1.8	.001	.990	100
Muddy Sections	6.1	2.4	-.199	.054	101
Bridge Crossings	5.5	1.6	-.067	.516	100
<i>Undesirable Attributes</i> <sup>2</sup>					
Long Straight Sections	4.4	1.9	.057	.582	101
Level Grades	4.3	1.8	-.233	.030	100
Smooth Trail Surfaces	4.2	2.0	.184	.074	101

<sup>1</sup> Means calculated using categories of "Extremely Undesirable 1" (coded "1") through "Extremely Desirable 9" (coded "9").

<sup>2</sup> Items with ratings > 5 on the scale were considered desirable and those < 5, undesirable.

Riders at Lake Johnson Park rated natural surroundings as highly desirable. The unpaved trails at the park are scenic, passing through the most beautiful sections of the park with striking views of the lake. This type of setting is rare in such urban surroundings. The preference for riding in natural surroundings is consistent with previous research (Watson, Williams, and Daigle, 1991) which suggests that mountain bikers often seek the same opportunities to enjoy backcountry areas as hikers do. Many mountain bikers appear to be looking for remote natural areas in which to enjoy their chosen activity. The unpaved trail at Lake Johnson Park definitely has all of the features which riders reported to be most desirable. The park's unpaved trails are characterized by a winding single track trail with hills and various technical sections such as "log crossings," "rocks," "logs" and "mud." In addition, all of this is found in a conveniently located natural setting along the edge of the lake.

The three features which mountain bikers considered undesirable on average, were "long straight sections," "level grades," and "smooth trail surfaces." These three features typically describe areas such as forest access roads and non-technical bike trails. Areas for mountain biking which are characterized by these undesirable features generally provide little challenge to riders. Lake Johnson riders seemed to be looking for a challenge. This fact was supported by the responses to the open-ended question about why respondents mountain biked. In their responses, respondents reported that challenge was an important reason for riding off-road. This was consistent with the findings of Hollenhorst et al., (1993). This apparently contributed to specialized mountain bikers disliking areas which feature long, straight, smooth, level trails. No doubt some mountain bikers may find areas with these features enjoyable for riding, however the riders surveyed at Lake Johnson Park did not. Riders at Lake Johnson Park used trails which were long, straight, level, and smooth (i.e., the paved trails and nearby paved bike path) primarily as a means to access the more desirable unpaved trails.

The second objective of this study was to determine whether activity specialization was related to preferences for various setting attributes. In the correlation analyses of the riders' levels of specialization and preferences, significant relationships were found to exist between 6 of the 18 features and level of

specialization. Five of these attributes, "fast downhill sections," "technical sections," "single track trails," "technical descents," and "log crossings/obstacles" were positively related to specialization. All these features typically make a trail more challenging and difficult to ride. This would perhaps explain the appeal of such attributes to specialized riders.

The one significantly and negatively related feature was "level grades". Flat trails typically are not as challenging as rolling and undulating trails. Unlike flat trails, it is much easier to generate speed on trails which are rolling and undulating. This point is especially true if the trail is fairly straight and smooth. Interestingly, both the attributes "smooth trail surfaces" and "long straight sections" were positively related to specialization, perhaps indicating that more specialized riders are more interested in the thrill of speed. This possible desire for speed is consistent with the finding that fast downhill sections were extremely desirable overall, receiving one of the second highest mean scores (7.9).

Two of the features ("muddy sections" and "creek crossing") which were desirable to mountain bikers overall were negatively related to specialization in the correlation analyses. In addition, one feature, "muddy sections," approached significance at the .05 level ( $p=.054$ ). In other words, as riders' levels of activity specialization increased, they found these attributes less desirable. One possible reason for these negative relationships may have to do with the value of the riders' equipment. As riders become more specialized they tend to ride more expensive and sophisticated bikes. In order to protect their investment and limit unnecessary wear and tear, more specialized riders may prefer to avoid sections with mud and water. Since these specialists ride more often they may not want to spend the time cleaning their equipment after every ride. It may also be possible that more specialized riders are more environmentally conscious and understand the negative environmental impacts associated with mud and water and the possible restrictions that might be placed on riding as a result of these impacts. In certain areas the presence of mountain bikers is most evident by the tracks they leave in the mud and on either side of water crossings. This notion that specialists might be more environmentally aware is consistent with previous studies (Williams and Huffman, 1986; Kauffman

and Graefe, 1984). Similarly, less specialized riders may see the riding of "muddy sections" and "water crossing" as a way of getting dirty and looking more experienced than they really are.

### Implications to Management

This study's most important management implication has to do with the information it provides about mountain bikers' preferences for various attributes of riding areas. The knowledge of which trail attributes attract mountain bike riders should help land managers better understand the needs of this growing group of recreationists. This understanding is essential for effectively managing existing mountain biking areas, planning for new mountain bike trails and managing mountain bike use in areas where such use could have negative impacts. By providing trails which better reflect the preferences of mountain bikers managers can enhance the recreation experiences of this growing group of customers. By providing trails in appropriate areas that are at the same time inherently appealing to mountain bikers, managers can more effectively steer riders away from sensitive resources or conflict prone areas. This more indirect "luring" of riders to appropriate areas can help minimize the need to resort to heavy-handed regulations and enforcement that may foster ill feelings and require expensive on-site management efforts.

The results of this study also suggest that mountain bikers of different levels of specialization prefer different types of areas for their riding. More specialized riders prefer more challenging and technically difficult areas. Managers that provide only one type of trail may not be meeting the needs of large groups of riders and potential riders of their trails. By knowing what riders of different levels of specialization prefer, managers can provide a variety of alternate trails that could better meet the needs of the whole spectrum of mountain biker riders and thereby maximize the recreation satisfaction their areas provide.

It was also significant that the mountain bike use at this park was found to be mainly due to a small core of heavy users. A small core of dedicated users should be easier to inform and work with than a large number of less frequent visitors. If this is true of other off-road riding areas, this has important implications for how managers can communicate with and influence their mountain bike visitors. Finally, this study reminds us that mountain biking is not just a backcountry activity. It is important in small urban/suburban parks and open spaces as well. Due to the proximity of these areas to where people live, managers of these areas must anticipate increased use by mountain bikers and plan accordingly.

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# ADVANCING ENVIRONMENTAL STEWARDSHIP IN NEW YORK STATE PARKS AND HISTORIC SITES

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Ninety state park and historic site managers were engaged in a cooperative problem-solving training exercise to identify what they suggest needs to be done to more effectively manage and protect the natural and cultural resources of the New York State Park System. The QtP (Quality-through-Participation) management process was used for this purpose, and proved effective in determining primary needs and action strategies to facilitate implementation of stewardship ideals and principles on a regional and/or park-specific basis.

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## Background

In 1993, the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) formally released a study on the condition of the park and recreation estate under its administrative jurisdiction. This study -- "Fostering Environmental Stewardship: A First Report on Managing and Protecting the Natural and Cultural Resources of the New York State Park System" (Cobb 1993) -- was initiated as a component of the "New York Statewide Comprehensive Outdoor Recreation Plan" that is updated every five years under administrative and statutory provisions of the Land and Water Conservation Act of 1965 (PL88-578, as amended). It was also undertaken in response to a gubernatorial directive for a stewardship action plan that "... would do more today to assure proper preservation and maintenance of our State Park System" (Cuomo 1990).

The study defined "environmental stewardship" as those policies, programs and resource management functions which serve to inventory, assess, protect or enhance the natural, cultural, scenic and recreational resources of New York's system of state parks and historic sites.

Implicit to this definition is the recognition of outdoor recreation as a beneficiary of clean water, clean air, pleasing landscapes and healthy ecosystems; that the state parks and historic sites themselves are perceived as benchmarks and standards for environmental quality.

This treatise is a sequel to a paper (Cobb 1993) summarizing the key findings and recommendations of the Fostering Environmental Stewardship Report presented at the Northeastern Recreation Research (NERR) Symposium in 1993, and constitutes a needs assessment for advancing environmental stewardship as determined by state park and historic site managers.

## Purpose of the Study

The primary purpose of OPRHP's Environmental Stewardship Report was to provide a preliminary evaluation of problems and threats affecting the integrity of the New York State Park System as well as to provide management with a comprehensive set of recommendations and action strategies for advancing stewardship ideals. A further purpose was to establish a framework for additional dialogue and appropriate follow-up action on a regional and park-specific basis. The New York State Park System consists of 11 park regions encompassing 150 state parks and 35 historic sites exclusive of the Adirondack and Catskill Parks. These regional facilities constitute diverse and distinctive

natural and cultural features as well as demographic variations among the more than 60 million people who visit them each year.

## Methodology

In order to enhance understanding and gain consensus in measures necessary for advancing environmental stewardship of the State Park System, 90 facility managers were enlisted to identify priority needs or issues that they felt were required to be addressed to more effectively manage and protect the natural and cultural resources of their respective parks or sites. The technique involved applying concepts learned in a three-day Quality-through-Participation, or "QtP" Management Training Program conducted at OPRHP's Facility Managers' Institute in the fall of 1993. QtP is based on a management philosophy that envisions a work environment where employees at all levels can make the most of their expertise and creativity, and make decisions that support improved service (Brass 1993). OPRHP is one of 12 prototype agencies in New York State government where the new concepts embodied in total quality management are being applied.

Participants in seven QtP training groups were given the opportunity to review the environmental stewardship report, and were briefed on its scope and purpose. This included a review of findings of OPRHP environmental audits as well as the results of a survey of facility managers conducted by the Nelson A. Rockefeller Institute of Government (NARIG 1993). The NARIG survey identified approximately 4,300 internal and external threats variously affecting the natural, scenic and cultural resources of state parks and historic sites. In general, the threats related to high levels of visitation; physical, chemical and biological intrusions; multiple, and often conflicting demands for use of park resources; incompatible adjacent land uses; the isolation of park ecosystems; and, the debasement of park scenery. Facility managers were also advised of comparable problems being experienced by other park administrations (Caneday 1991; Meyers and Reid 1986; PCAO 1987), including those specific to the states of California (DPR 1983) and Missouri (DNR 1992) as well as the US National Park System (US GAO 1987; US NPS 1981). Similarly, managers were informed of OPRHP's concern about stewardship issues at joint public hearings conducted by New York State Assembly and Senate oversight committees in October 1993 (Caccese 1993).

## Findings

Table 1 is a compendium of what OPRHP facility managers suggest needs to be done to more effectively advance environmental stewardship of state parks and historic sites. As noted, the primary concern to managers is the need for adequate personnel and fiscal resources to properly maintain and operate facilities. Indeed, at the legislative hearings on stewardship, it was established that since 1975, the number of OPRHP's permanent employees had decreased by over 30 percent, park attendance had increased by 50 percent, and a myriad of new programs, mandates and facilities had been added to OPRHP administrative responsibilities. These additional responsibilities required the expenditure of over \$20 million, or 20 percent of the agency's total operating budget that was not required to be spent in 1972.

Table 1. Facility managers' determination of primary needs for enhancing the management and protection of the natural and cultural resources of New York State Parks and Historic Sites.

Need/Issue Area	Number of QtP Groups Recognizing "Need" as a "Top 3" Major Priority <sup>a</sup>	Number of QtP Groups Recognizing "Need" but not as "Top 3"	Total percent of Groups Identifying "Need"
Availability of sufficient funds, staff and expertise to do the job	7	--	100
Training and professional development	5	1	86
Ability to identify, assess and/or help mitigate problems and threats to park resources resulting from adjacent properties, despoilation of viewsheds, air and water pollution, soil erosion, vandalism, overuse, et al.	4	3	100
Developing and/or updating master plans for state parks and historic sites	3	4	100
Information (inventories, surveys and research) about the natural and cultural resources, and the people who use them	3	2	71
Building formal and informal partnerships with other governmental organizations interest groups and the private sector	2	5	100
Public relations and communication: increasing public awareness, support and/or involvement in the park management function	1	6	100
Placing more emphasis on environmental education and interpretive programs for both internal and external customers	1	5	86

<sup>a/</sup> Note: Each of the seven groups was asked to prioritize the three major needs of those identified. (Major priority needs incorporate tied rankings.)

The second priority need identified by facility managers is for training and professional development in the area of natural and cultural resources management. Facility managers have an array of educational backgrounds and experience, but see an on-going need for broadening their expertise and improving skills applicable to a large and diverse number of resource conditions.

Consistent with training and staff development, managers recognize the further need to assume a more pro-active posture in addressing problems and threats to park resources. Of the some 4,300 threats identified in the NARIG survey, about 30 percent were considered major or extreme.

Fourth, facility managers want plans that establish a clear direction for management. Developing and/or updating master plans for state parks and historic sites is a requisite for advancing stewardship and monitoring the condition of these facilities.

Lack of scientific or technical information at the park or site level is a problem that can exacerbate existing conditions. As a fifth important need, managers point out that it is difficult to manage and protect resources that are not well understood. They suggest that natural and cultural resource inventories be conducted in a systematic and timely manner.

A sixth need is for OPRHP to strengthen formal and informal partnerships with other organizations including the National Park Service, the NYS Department of Environmental Conservation, research institutions, and citizen interest groups. Facility managers note that many of the challenges posed by environmental stewardship are too big, and the needs too essential for them to handle on their own.

The two remaining findings of managers were the related needs of increasing public awareness and support of the park management function as well as to enhance public understanding and appreciation of natural and cultural resources through expanded environmental education and interpretive programs.

#### Discussion

The 1993 Facility Managers' Institute provided a valuable opportunity to ascertain what park and site managers perceive, in a comprehensive manner, what is needed to uphold stewardship ideals and principles embodied in OPRHP mandates, mission and vision statements.

Based on feedback from the seven working groups, and the substantive nature of the needs assessment, QtP proved to be a productive use of this management style on an issue that impacts all OPRHP facilities, and which requires understanding and commitment at all levels of management. Additional feedback from the QtP groups points out, however, that more time is required to address what is properly characterized as a complicated issue. Such continuity is implicit to the action plan for advancing environmental stewardship of New York State parks and historic sites.

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# EDUCATIONAL TRAINING AND ATTITUDES TOWARDS RECYCLING AMONG CAMPGROUND MANAGERS IN IOWA

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In surveying managers of Iowa's campgrounds to determine their attitudes and behavior regarding recycling, it was found that attitudes were related to the type of educational backgrounds. For example, managers with park and recreation degrees had less strong conservation orientation than those with educational training in natural sciences which tended to develop the strongest conservationist orientation.

## Introduction

The garbage crisis has become a critical issue for nearly every governing body in this country. With the amount of waste increasing every year and solid waste disposal sites filling up and closing rapidly, the need to encourage recycling becomes more critical each day. Yet developing and implementing waste disposal plans is increasingly difficult especially for park and recreation agencies with limited resources and vague directives.

Iowa's parks and camping areas provide an excellent setting for the exploration and evaluation of attitudes and behaviors regarding recycling and comprehensive waste management programs. In the fall of 1991, Iowa State University completed a comprehensive study of Iowa campground managers to document current solid waste management practices and recycling efforts and to identify recreation site managers' attitudes, perceptions, knowledge and motives regarding recycling and solid waste disposal technologies.

When one tries to look at the reasons why one manager is more accepting of recycling in their campground and more motivated to develop and implement new solid waste disposal programs and policies, many questions arise. There are many factors which affect people's attitudes and behaviors. One factor that has been examined in other studies is educational training (Pletcher, Walther & McConocha 1989). In this paper we examine that link between educational background and attitudes towards recycling.

Thus, the objectives of this paper are twofold:

1. To identify and classify park managers' perceptions of the benefits and barriers to the development of comprehensive park based recycling programs;
2. To examine the relationship between educational training and park managers recycling perceptions.

## Methods

The survey of all public and of Iowa's campgrounds was conducted in the Fall 1991 by Iowa State University (Robertson 1992). A 10-page booklet was sent to the managers of all 488 of Iowa's public and private campgrounds. Subtracting questionnaires found to be duplicative, a total of 378 usable questionnaires were completed for a final response rate of 86%. Because of non response on the educational background question, only 292 respondents are included in our analysis of variance. The

response rate varied by administrative unit of camping area, 88 % of managers of state parks responded, 100% of the federal campground managers, 74% of the county and local managers and only 30% of the private campground managers. The final number of managers included in the study is shown in Table 1.

Table 1. Number of response by type of campground.

# of managers	type of campground
59	State
19	Federal
263	County
12	Local
2	Not for profit
23	Private

This paper looks at the relationship between two variables, educational background and the attitudes of campground managers towards recycling. The variable of educational background was defined by grouping the different educational programs which managers listed as their "educational training" into three main categories which we called Natural Sciences, Resource Management and Park and Recreation/Social Sciences. Table 2 shows how the variable was defined.

Table 2. Definition of educational training.

	Number	Percent
NS <u>Natural Sciences</u> (Biology, Ecology, etc.)	161	54.9%
RS <u>Resource Management</u> Forestry	25	8.5%
Natural Resource Management (Fish & Wildlife, Range Mgmt.)	15	5.1%
PR <u>Park and Recreation/Social Sciences</u> Park & Recreation Management	66	22.5%
Social Science	3	1.0%
Law Enforcement	5	1.7%
Education	6	2.0%
Business Administration	6	2.0%
Associate of Arts	6	2.0%

The variable of attitude towards recycling was developed by performing a factor analysis on the 39 reasons listed in the questionnaire for recycling or not recycling. Respondents were asked to rate on a 5 point scale from "not important" to "extremely important" 22 reasons for recycling and 17 reasons for not recycling. The factor analysis yielded 10 interpretable and conceptually meaningful factors with eigenvalues above 1.0 which we tested for internal reliability. These 10 factors explained 65% of the total variance. Table 3 lists the factor names, the item content, the reliability test's alpha level, the eigenvalues and the proportion of variance explained by each of the 10 factors. Finally, to examine the relationship between the attitude variable and educational background, we used a one-way analysis of variance of the 10 scales created from the factors and the 3 types of educational background.

Table 3. Results of factor analysis.

(alpha)	Factor Loading	Explained Variance
Factor 1 (.882)		18%
<u>Resource Conservation</u>		
To conserve energy	.798	
To conserve natural resources	.773	
It saves resources for future generations	.771	
Due to shortages in raw materials	.762	
Recycling is an effective way to protect and preserve resources	.693	
To save landfill space	.689	
Factor 2 (.718)		14%
<u>Social values</u>		
To be recognized as an environmentalist	.78	
Because I recycle at home	.678	
Because it makes a person feel good	.671	
Because it is the right thing to do	.559	
Factor 3 (.653)		7%
<u>Inconvenience</u>		
Don't want to be bothered	.695	
Abundance of raw materials	.687	
Lack of financial incentives	.629	
Factor 4 (.766)		5%
<u>Administrative barriers</u>		
Not enough staff to manage a recycling program	.814	
Lack of appropriate facilities for recycling	.687	
No pickup service in the area	.616	
Too costly to administer	.569	
Factor 5 (.829)		4%
<u>Educational values</u>		
To introduce park visitors to recycling	.714	
To educate park visitors on the values of recycling	.632	
To set a good example for park visitors	.549	
Factor 6 (.684)		4%
<u>Social pressures</u>		
Legal requirements	.72	
Because other park and recreations areas recycle	.66	
To help charitable organizations	.647	
To create local jobs	.491	
Factor 7 (.630)		4%
<u>No support</u>		
Agency doesn't encourage development of recycling programs	.684	
Campers would not participate in programs	.687	
Lack of volunteer or interest group support	.51	
Too costly to administer	.569	
Factor 8 (.717)		3%
<u>Structural barriers</u>		
No market for the recycled materials	.78	
Not enough garbage to justify development of recycling program.	.46	
Too costly to administer	.403	
Lack of volunteer or interest group support	.326	
Factor 9 (.593)		3%
<u>Not required</u>		
Should be left to volunteer and not-for-profit groups	.75	
Should be left to private sector	.67	
Don't know how to recycle	.404	
Factor 10 (.424)		3%
<u>Economic reasons</u>		
To reduce the cost of garbage collection	.789	
To get money for recyclable materials	.590	

## Results

The results of the analysis of variance are shown in Table 5, but can be summarized in the following 10 statements:

1. Park and Recreation Management graduates consider conservation a less important reason for recycling than graduates of Natural Sciences.
2. Resource Management graduates consider social values significantly more important reason for recycling than either of the other two groups.
3. Park and Recreation Management graduates rate inconvenience as a more important reason for NOT recycling than graduates of either Natural Sciences or Resource Management.
4. Administrative barriers were rated as significant reason for NOT recycling by all campground managers regardless of educational background.
5. Resource Management graduates felt the educational value of recycling programs were significantly more important than the Natural Science majors.
6. Resource Management and Park and Recreation graduates felt significantly more social pressure to recycle than the Natural Science majors.
7. No significant differences were found between the groups ratings of the lack of support variable.
8. Park and Recreation Management graduates consider structural barriers to be significantly more important reasons for NOT recycling than graduates with Natural Sciences backgrounds.
9. Resource Management graduates rated leaving recycling programs to other groups as a significantly less important reason for NOT recycling than the managers of the other two educational backgrounds.
10. Resource Management graduates consider economic reasons significantly more important reason for recycling than either of the other two groups.

Table 4. Results of analysis of variance.

Factor number and name F ratio and probability	Means for each type of educational background (codes used to indicate significant difference)		
	NS (a)	RS (b)	PR (c)
1. Conservation F=4.21 .016	3.57	3.53	3.37a
2. Social values F=6.67 .001	2.89	3.19ac	2.66
3. Inconvenience F=5.67 .006	1.78	1.98	2.13a
4. Administrative barriers F=1.90 .152	3.33	3.43	3.12
5. Educational values F=3.69 .026	3.56	3.94a	3.62
6. Social pressures F=7.45 .0007	2.32	2.60a	2.60a
7. No support F=1.88 .155	2.16	2.32	2.07
8. Structural barriers F=4.47 .012	2.78	3.09	3.11a
9. No requirements F=8.71 .0002	1.70	1.29ac	1.81
10. Economic reasons F=5.69 .004	2.69	3.14ac	2.63

a, b, c indicate which variables are significantly different from each other

## Conclusions and Implications

To summarize the conclusions, the Natural Science majors were the most conservation oriented, tending to see the need to recycle in more scientific or biological terms. They were the least likely to see the educational benefits of recycling programs, and weren't swayed by social pressures.

The Resource Management majors were the most interested in being recognized as an environmentalist and recycled because it was the "right thing to do". They more strongly favored using recycling program for educational purposes and though they wanted to educate the public, they were least likely to think the job of recycling should be the responsibility of anyone else but themselves. They were the group that saw the most value in recycling for economic reasons.

Park and Recreation/Social Science majors were the least conservation oriented, tended to be most likely to see the barriers to recycling. They more than any other group felt that recycling

was an inconvenience. Not surprisingly they were most likely to think that someone other than themselves should handle the job of recycling and were the group most often to say that they didn't know how to recycle. Managers with this type of educational background were the least interested in being recognized as environmentalists. They were most swayed by social pressures of others recycling and were more likely than other groups to cited reasons to recycle in terms of helping charitable groups or created local jobs.

The implications of the findings of this study could be seen from a number of different orientations. Certainly there are implications for those in the educational training field. College programs should be aware of both the strong points and the deficiencies of their respective programs. Natural Science majors could use more emphasis on social aspects, for example, to see the educational benefits in recycling programs. Park and Recreation educational training could certainly benefit from more emphasis on the biological aspects as they apply to programs such

as recycling. Helping Park and Recreation majors develop a stronger conservation ethic would broaden their view of management jobs.

Another orientation might be that of marketing. One could use these findings to better market recycling programs to each of these different groups. Tailoring the message of the need to recycle to each groups' orientation will more than likely help "sell" the concept.

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# VALIDITY OF USING PHOTOGRAPHS TO SIMULATE VISIBLE QUALITIES OF FOREST RECREATION ENVIRONMENTS<sup>1</sup>

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Forest recreation managers and researchers interested in conserving and improving the visual quality and recreation opportunities available in forest environments must often resort to simulations as a means of illustrating alternatives for potential users to evaluate. This paper reviews the results of prior research evaluating the validity of using photographic simulations to represent forest environments (i.e. comparing responses obtained in the field to those of photographic representations). The findings of three previously unreported validity tests conducted in northeastern forests are presented. The results indicate that simulations are both effective and appropriate useful to represent in stand conditions. However, simulations that involve a portion of a wider vista may have difficulty establishing the wider context of the scenes.

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## Introduction

Photographic representations have been used in studies of landscape perceptions and preferences because they offer greater economy, speed, and control than site visits. The use of photographs avoids the costly and time-consuming task of transporting respondents to the scenes, and photographs can be altered to allow for controlled comparisons among alternative conditions.

Studies have repeatedly shown that evaluations done from photographic representations are highly correlated with on-site evaluations of the same areas. However, this body of research is not without its weaknesses, such that a researcher can not always generalize from one study to the next or find guidance for their own research approach. As Zube et al. (1982) point out, there is no theoretical framework that brings coherence to the wide variety in the type of scenes studied, the regions where these studies take place, and the research methods employed. The scope of scenes used in these studies range from forested through open countryside to suburban and urban landscapes. The scale of these scenes ranges from small-scale foreground views to large-scale vistas.

While research in the area of visual qualities of forests exist -- over 100 empirical reports -- most studies have been done in the coniferous forests of the Southwest (Hoffman et al. 1993). A few studies have focused on the northern hardwoods (Brush 1979; Palmer 1990, 1993; Ribe 1990) and only one study looked specifically at slides as a valid and reliable media for representing in-stand forest conditions (Shafer & Richards 1974).

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This paper reviews the literature investigating the validity of photographic media to represent environmental conditions, and summarizes the findings for three new studies that investigate the validity and reliability of photographic media for representing the visible conditions of hardwood forests in the Northeast. The three studies considered middle ground views of clearcutting alternative in the White Mountain National Forest, New Hampshire, the visual effects of slash after an uneven age management harvest cut at Cuyler Hill State Forest, New York, and the impacts of deer pressure on forest regeneration at Fools' Creek in the Alleghany National Forest, Pennsylvania.

## Literature Review

A total of 16 studies have been identified that explicitly tested the validity of photographic media to represent the visual quality of the environment. Of these only three took place in northeast. Table 1 summarizes the characteristics of these studies.

## Studies Done in the Northeast

The results of Brush's (1979) study of scenic preferences of forested areas in Massachusetts found a correlation of  $r = 0.67$  ( $p = 0.001$ ) between those scenic evaluations done from color photographs and those done in the field. The evaluations were completed by two groups of non-forestry students. Both groups used the same five-point scale for their evaluations ranging from very attractive (1) to very unattractive (5). One group of 48 evaluated 10 color photographs; the other group of 48 rated the forest sites in the field from the same view point and in the same direction that the photographs had been taken. Brush notes that some of the variance may be explained by the changes that occurred at the sites during the year that lapsed between the field and photographic evaluations.

The watersheds of the upper East Branch of Brandywine in Chester County and the North Branch of Neshaminy Creek in Bucks County, Pennsylvania were the study sites for Coughlin and Goldstein (1970). Two respondents evaluated 92 in-field points along a road; three to four color slides taken from these same points were used for slide evaluations completed by 11 respondents. All the respondents were affiliates or employees of the Regional Science Research Institute. A seven-point interval scale ranging from 1 = most negative response to 7 = most positive response was used. The authors reported that the mean ratings of the field respondents were significantly correlated ( $r = 0.64$ ,  $p < 0.001$ ) with the mean scenic beauty rating given by the respondents which evaluated slides of each location.

Rabinowitz and Coughlin (1971) used 14 sites on the banks of small streams in the vicinity of Philadelphia. The character of the sites ranged from densely to somewhat less densely developed suburban areas, including open farm country about 20-miles outside the city. The majority of the sites were wooded. Ten suburban housewives completed the in-field evaluations; eight respondents, also suburban housewives, completed the slide evaluations from 39 slides - one to three slides for each of the 14 stream sites. The field group used a two-page questionnaire which included a request for a brief objective description of each site, 14 five-point rating scales (1 = dislike very much, 5 = like very much), and 15 five-point semantic differential scales. The slide group used a one to five point scale for three preference questions regarding the respondents preferences to "live here," "a place to pass through and enjoy the scenery," and "to use this site for recreation". Also, six weeks after the in-field evaluations had been completed the same 10 respondents were asked to complete evaluations from slides of the sites they had visited. The correlations between the in-field and slide evaluations which were completed by the one group were greater than  $r = 0.89$  ( $p < 0.001$ ). Results comparing the evaluations of the field and slide-only groups were not reported.

Eight sites representing urban to forested landscapes were used by Shafer and Richards (1974) in their study comparing viewer reactions to outdoor scenes and photographs of those scenes. Three groups of respondents, randomly selected undergraduate photography students at Syracuse University in Syracuse, New

York, evaluated the eight scenes from either in-field, slides, or color photographs. They used 27 bi-polar, seven-step semantic differential scales for the evaluations. These authors concluded that when color slides or photographs adequately depict most of the variation of natural and man-made environments, the adjective-pair measurement of responses to the picture presentations agree with similar in-field responses to the same scenes.

Zube et al. (1975) used an 18-point semantic differential scale, a landscape-feature checklist, scenic quality categories, and preference for use rank order in the evaluation of scenes in the southern half of the Connecticut River Valley. Thirteen sub-groups evaluated scenes which included working farms, village centers, suburban neighborhoods, strip developments, and forests. Five of the groups completed the in-field evaluations; the other eight groups completed the evaluations from panoramic and regular format color photographs. Responses of each sub-group were correlated with those of every other sub-group. Results reported show 82 percent of the correlations at  $r = 0.80$  level or higher.

#### Studies Done Outside the Northeast

Twenty campsites located at five areas within Mt. Jefferson Wilderness Area in Oregon served as study sites for Shelby and Harris's (1985) study of campers' scenic beauty acceptability and camping desirability preferences. The 427 respondents completed evaluations for three to five campsites in the field and from color photographs during their visit using a five point scale with 1 = totally acceptable and 5 = totally unacceptable. They also ranked the sites in order of preference. The authors reported that of the 20 campsites evaluated in-field and from photographs the average scenic beauty acceptability evaluations were significantly different at two sites ( $p < 0.05$ ), and the average camping desirability evaluations were significantly different at five sites. On the sites where disagreement occurred, the evaluations done from photographs were higher than the in-field evaluations. However, for the overall preference rankings, where photograph and in-field rankings agreed for 15 of the 20 sites, the rankings based on photographs were lower than those based on in-field scenes where disagreement occurred.

The respondents in Shuttleworth's (1980) study of scenic beauty evaluations done in the field and from photographs viewed 12 scenes of the University of East Anglia, England. Ninety-three environmental studies students were divided into two groups each of which completed in-field evaluations of six of the 12 scenes. The two groups were then further subdivided -- half of each group evaluated the scenes from black-and-white photographs, the other half from color photographs. They used seven semantic differential landscape scales and rank ordered the scenes for scenic beauty. The results indicate that there were very few significant differences between the evaluations. Black-and-white photographs tended to induce more extreme and more differentiated responses than the color photographs. Evaluations from color photographs agreed more closely to those done in-field than the black-and-white photographs.

Boster and Daniel (1972) used six Ponderosa pine sites in Arizona for their study sites. Five of the sites had received treatments -- uniform stripcut, clearcut, heavy thinning, and conventional logging. The remaining site was a natural, untreated area. The respondents for this study included: 27 Northern Arizona University students who completed scenic beauty evaluations of the six sites in the field, and 30 University of Arizona students and 10 members of the Arizona Water Resource Committee who completed the scenic beauty evaluations from slides of each of the six sites. All the evaluations were done using a 10-point scale with 0 being "I am absolutely certain that I dislike the area represented by the slide/scene" and 9 being "I am absolutely certain that I like the area represented by the slide/scene." Their results show that the mean ratings of the field and slide groups to be statistically indistinguishable with a correlation of  $r = 0.99$ .

Eleven forested campgrounds in north-central Arizona served as sites for Brown et al.'s (1988) study of campers' scenic beauty preferences. Seven hundred and twenty-seven campers evaluated the scenic beauty of the campsites both in the field and from color photographs. A 10 point scale was used for the evaluations ranging from 1 = very low scenic beauty to 10 = very high scenic beauty. Individual t-tests showed that the ratings done in the field were all significantly higher than the photo-based ratings of the same sites. The correlation between mean ratings done in the field and those completed from the photographs was  $r = 0.76$ , suggesting that photo-based ratings do provide a reasonably good indication of relative on-site scenic beauty.

Clamp (1975) had 75 volunteer respondents complete scenic beauty evaluations of 170 sites representing a variety of landscapes characteristic of England. (Major urban centers and military property were avoided.) All the respondents completed evaluations in the field and from color slides. A 12-point scale was used for the evaluations ranging from 1 for "very, very attractive" to 12 for "very, very unattractive." The comparison of in-field and slide evaluations resulted in a correlation of  $r = 0.80$ .

A broad array of landscape types -- residential areas, shopping centers, commercial highway strip, light industrial park, office complex, and grazing land -- were used in scenic beauty evaluations for Craik's (1975) study in Marin County, California. A random county-wide sample of 522 respondents completed descriptive evaluations of the scenes from an auto tour through a site, a color film of a simulated eye-level tour through a scale model of a site, or a black-and-white video of the scale model tour. The evaluations were in the form of a checklist of 240 adjectives frequently used to describe landscape scenes. Respondents were told to read through the list and put an "X" beside each adjective they considered descriptive of the designated landscape. Craik reported correlations of  $r = 0.80$  and better for comparisons of adjectives checked to describe each of the presentation formats.

Hull and Stewart (1992) had respondents evaluate 12 scenes in the White River National Forest in Colorado for scenic beauty and recreation satisfaction. Respondents included two groups each of 45 day-hikers and one group of 32 students. The day-hikers completed in-field evaluations during their visit; their photo evaluations of the same scenes were completed both three and nine months later from a booklet of color photographs sent to them by the researchers. The students completed the evaluations from slides of the same scenes twice over a three month period. Correlations between the in-field and photo evaluations of the day-hikers was  $r = 0.80$  ( $p = 0.05$ ). Correlations between the in-field groups and the students were reported as  $r = 0.85$  ( $p < 0.01$ ). The authors suggest that the differences between in-field and photo-based evaluations seem to be caused, in part, by differences in meaning, novelty, and mood between the in-field and photographic contexts.

Lane et al. (1975) had 66 students complete scenic beauty evaluations in the field and from three simultaneously projected color slides of five sites located in the upper Piedmont area of South Carolina. The five areas included a picnic area on a lake, a hardwood stand on a relatively steep slope, a small lake with a forested shoreline, a picnic area on a small stream in a hardwood stand, and a loblolly pine plantation. The respondents used a nine-point scale ranging from 1 = like extremely to 9 = dislike extremely. Results reported that with the exception of the small lake area, the sites were given a higher scenic beauty preference from the slide evaluations than from the in-field evaluations. The authors suggest that this may be because the slides tend to "glamorize" some sites. For example, roads and parking areas were not evident in the slides, but they were apparent in the field.

Kellomaki and Savolainen (1984) had respondents complete scenic evaluations of 34 forest stands at forestry field stations located near the University of Helsinki. Five groups of respondents completed the evaluations using a seven-point, single adjective scale. The first two groups, comprised of first year

forestry students, evaluated scenes both in the field and from black and white photographs. The other three groups -- another group of forestry students and two groups of randomly selected city dwellers -- completed evaluations from only the black-and-white photograph. The correlation between field and photographic ratings done by the two first two groups was  $r = 0.94$

( $p < 0.01$ ). A correlation of  $r = 0.83$  ( $p < 0.01$ ) was reported when the ratings from the photographs only were compared across all five groups. Kellomaki and Savolainen concluded that black-and-white photographs may be a reliable tool for estimating the scenic value of forest landscapes.

Table 1. Studies that sought to validate the efficacy of photographic media with field evaluations.

	Correlation	Region	Forested Open countryside Urban/suburban	Scenic beauty Other connotative attributes Denotative attributes Specified a use in context	Black and white Color Prints Slides Film or video Panoramic montage	Different field/photo subjects Same field/photo subjects Controlled for field/photo order	Sampling method
Boster & Daniel, 1972	.99	SW	•	•	• •	•	S/C
Brown et al., 1988	.76	SW	•	•	• •	•	U
Brush, 1979	.67	NE	•	•	• •	•	S/U
Clamp, 1975	.80	E	• • •	•	• • •	•	R
Coughlin & Goldstein, 1970	.64	NE	• • •	•	• •	•	S
Craik, 1975	>.80	SW	• •	• •	• • •	•	R
Hull & Stewart, 1992	.80	SE	• •	• •	• • •	• •	S/U
Kellomaki & Savolainen, 1984	.83	E	•	•	• •	• •	S/R
Lane et al., 1975	n/a	SE	•	•	• • •	•	S
Rabinowitz & Coughlin, 1971	.89	NE	• • •	• • • •	• • •	• •	R
Shafer & Richards, 1974	n/a	NE	• • •	• • •	• • •	•	S
Shelby & Harris, 1985	n/a	NW	•	• •	• •	•	U
Shuttleworth, 1980	.89	E	• • •	• • •	• • •	• •	S
Sorte, 1975	n/a	E	•	• • •	• • • •	•	U
Stewart et al., 1984	.67	SW	• •	• •	• •	•	R
Zube, Pitt & Anderson, 1975	.80	NE	• •	• • •	• •	•	S/R

Notes : Sampling method for respondents: available students (S), civic groups (C), random (R), or users (U).  
Region of study: northeast (NE), northwest (NW), southeast (SE), southwest (SW), or Europe (E).

Sorte (1975) looked at evaluations done in-field and from various media types for two urban/suburban row house-type living units in Sweden. The respondents completed evaluations from plan and perspective illustrations, models, color slides and a movie taken of the models, and color slides and a movie of the actual sites. The seven-point semantic scale used for the evaluations were based on pleasantness, enclosedness, complexity, social status, and unity. A review of the means reported shows that the mean evaluation for the model-based slides and movie, and the field-based slides and movie were lower than the mean ratings from the in-field evaluations done at both sites.

Stewart et al. (1984) had seven respondents make  $100 \pm$  site visits at various times of the day to evaluate visual air quality. After completing the in-field evaluations, the respondents photographed each of the specified views around Denver, Colorado. Seven point scales were used to evaluate the visual air quality based on clarity, border, and source. In evaluations done from the photographs they had taken, the means of those evaluations across respondents were compared with the corresponding means of evaluations done in the field. For all but two respondents, the mean from photographs was significantly lower ( $p < 0.01$ ) than the mean from the in-field evaluations. The authors suggest that

this may indicate a tendency for visual air quality to look worse in photographs than in the field. Median correlations for each respondent between evaluations of photographs and in-field ranged from  $r = 0.51$  to  $r = 0.83$ .

### Study Methods

The materials and data for this paper are drawn from three northeastern hardwood forest sites being studied to better understand major forest management issues.

#### White Mountain National Forest in New Hampshire

The visual affect of harvesting alternatives were simulated in this study from two vista sites: Sugar Loaf and Welsh Ledge. In all there were 30 simulations representing different sized clearcuts, patterns and intensities. These simulations represented variation in the size of the clearcut openings (approximately 4.5, 12 or 25 acres), the intensity of the cutting (1, 2, 3, 4, or 5 percent of the viewshed), and the placement pattern (scattered or concentrated) of the cutting sites. Also included among these simulations were the photograph of the original view take the previous year and a completely revegetated simulation. Twenty-six different hikers at each site ( $n = 52$ ), used a 10-point bi-polar scale to rate the scenic value of all 32 scenes. The interviews were conducted in the field at the view point. The hikers also rated the actual view and were asked to locate the scene that most resembled the view from among the 32 photographs.

#### Cuyler Hill State Forest in Central New York

This is a demonstration site for uneven age single-tree selection silviculture. The area was marked according to research guidelines and harvested by a commercial logger in late-August 1993. The last previous harvest was in mid-1970. Two existing data collection points with similar appearance were selected in the treatment area and a third point from a neighboring research stand with similar forest structure was selected as a control site. All three sites were photographed in mid-July. The two treatment sites were rephotographed a week after the harvest. The slash was lopped to the ground at one of these sites and rephotographed. This resulted in the sites representing three different field conditions: uncut, slash, and lopped. Two non-overlapping views were photographed using color 35mm film at all three sites in their uncut condition, at two sites in their slash condition, and one with the slash lopped. All three sites were visited by 12 landscape architecture students during September and the harvested sites by 20 forestry students in October.<sup>2</sup> Twenty-four bi-polar scales were used to describe various visible forest characteristics, including overall scenic beauty. All participants rated the field sites and twelve photographic slides.

#### Allegheny National Forest in Western Pennsylvania

Regeneration failure after harvesting in western Pennsylvania forests has become a serious problem due to excessive browsing by the deer population. Fenced plots at Fool's Creek have been established to study the effects of deer density on forest vegetation. There were two controlled densities of 10 and 64 deer per square mile. Within each density, there is an area that has been uncut, thinned to 60 percent stocking, and clearcut in 1968. A third unfenced site was clearcut and remained open to the natural density of greater than 100 deer per square mile. During the second week of September, 1994, a color 35mm slide was taken at each site to represent each management condition. for a total of 7 slides. On 16 October 1994, a group of 27 students and their professors on a biology field trip evaluated all the slides and sites. They used 24 bi-polar scales to describe the forest's visible characteristics, including an overall rating of scenic beauty.

### Findings

The data provided for 14 comparisons between ratings in the field and of photographic representations: 2 in White Mountain National Forest, 6 in Cuyler Hill State Forest, and 7 in Allegheny National Forest. The mean ratings for these sites are shown in table 2, along with paired  $t$ -test and Pearson correlation coefficients. In 10 cases, the rating in the field was more scenic than of the photograph or slide, in 3 cases it was less scenic, and in 1 they had the same value. A two-tailed sign test indicates a probability of .092 for this or a more extreme distribution. While there is an obvious pattern of higher ratings being made in the field, it does not meet the normal threshold of statistical significance. In only three cases did the  $t$ -test indicate that the field and photographic ratings are significantly different at the .05 level. The average correlation between the field and photographic ratings is .388, substantially below those in the literature review.

#### White Mountain National Forest

This study was originated by the Forest Service because they were unaware of the public's awareness and attitude towards clearcutting on the National Forest. The presence of harvesting activity in the field view was recognized by 96 percent of the respondents at Sugar Loaf and 81 percent at Welsh Ledge. Hikers correctly picked the actual view out of 32 photographs 36 percent of the time at Sugar Loaf and 26 percent of the time at Welsh Ledge. While these levels of recognition are not exceptionally high, it must be remembered that all 32 photographs were quite similar and from exactly the same view point. The binomial test sets the probability of this many hikers at either site identifying one item out of 32 is *very, very* small ( $p < .0001$ ). This result indicates we can have some confidence that observers are able to use subtle distinctions present in a photograph to distinguish a scene.

The ratings of the actual view are much higher than for the photograph. In addition, the Pearson correlation between the field and photo scenic rating is .258 at Sugar Loaf and .241 at Welsh Ledge. These two results indicate a poor correspondence between scenic evaluations made in the field and from the photographs. Probable causes for this are that the previous year when the photos were taken was drier and vegetation was therefore browner. Perhaps more important is that the contextual affect of a breathtaking vista in the field cannot be fully represented by in single photograph. Respondents had trouble limiting their scope of view and wanted to focus on landmarks (e.g. Mount Washington from Sugar Loaf) outside the photograph. This was true even though they were directed where to focus their attention when rating the view in the field.

<sup>2</sup>The uncut control site could not be visited because access was blocked by a vehicle left in the middle of the road by a thoughtless NYS DEC employee.

Table 2. Means, *t*-tests and correlations for scenic ratings in the field and matching photographs or slides for views at several sites.

Evaluation sites	Mean		<i>t</i> -test		Pearson Correlation	n
	Field	Photo	<i>t</i> -value	p (2-tail)		
<b>White Mountain NF: view point <sup>a</sup></b>						
Sugar Loaf	6.23	3.54	4.53	.0001	.258	27
Welsh Ledge	7.08	5.71	2.70	.013	.241	24
<b>Cuyler Hill SF: treatment, raters <sup>b</sup></b>						
Uncut, LA	3.25	3.17	0.24	.815	.245	12
Cut with slash, LA	3.83	4.88	-1.71	.116	.051	12
Cut with lopped slash, LA	3.67	3.21	2.26	.067	.807	12
Uncut, For	--	3.16	--	--	--	20
Cut with slash, For	3.35	3.97	-1.67	.110	.288	20
Cut with lopped slash, For	3.65	3.16	1.59	.127	.449	20
<b>Allegheny NF: density, treatment <sup>b</sup></b>						
10 d/sm uncut	2.13	1.96	1.16	.257	.781	23
10 d/sm, thinned	2.72	2.56	0.46	.651	.097	25
10 d/sm, clearcut	3.96	3.58	0.89	.380	.196	26
<b>64 d/sm, uncut</b>	<b>2.65</b>	<b>2.00</b>	<b>3.16</b>	<b>.004</b>	<b>.501</b>	<b>26</b>
64 d/sm, thinned	2.66	2.11	1.97	.066	.355	18
64 d/sm, clearcut	4.59	4.59	0.00	1.00	.375	22
Uncontrolled, failed clearcut	2.95	3.05	-0.37	.715	.791	21

<sup>a</sup> Rating scale of 1 = low scenic value to 10 = high scenic value.  
<sup>b</sup> Rating scale of 1 = beautiful to 7 = ugly.

**Cuyler Hill State Forest**

The results of an analysis of variance shown in Table 3 indicate that there is no significant difference between evaluations made in the field and of slides of the same condition at the same site. Nor did it matter whether the evaluations were made by students trained in forestry (i.e. more oriented toward the benefits of timber productivity) or landscape architecture (i.e. more oriented toward minimal environmental impacts and aesthetic benefits). However the effect of treatment was significant. Tukey's LSD post hoc test indicates that the cut with slash condition was judged significantly more ugly than the uncut ( $p = .002$ ) or lopped ( $p = .008$ ) conditions. The difference between the uncut and lopped conditions was not significant ( $p = .251$ ). The only interaction term to be significant was between treatment and

field/slide. This is probably due to the influence of the landscape architecture students' ratings of the untreated slash condition, which almost reached significance in Table 2.

Two slides were used to represent the three field conditions. A Tukey's LSD indicates there is no significant difference between the slides at the uncut ( $p = .537$ ) and lopped ( $p = .691$ ) sites, it is significant at the cut site with slash ( $p = .006$ ).

Over all, this provides a strong indication that slash has a negative visual affect that can be mitigated by lopping. These results also support the efficacy of slides to evaluate the visual impacts of slash in hardwood forests.

Table 3. Analysis of variance for the effects of field or slide evaluation, slash treatment, respondent background, and their second order interactions on scenic beautiful at Cuyler Hill State Forest.

Source	df	Sums of Squares	Mean Square	F-ratio	Probability
Constant	1	3218.3	3218.2	1606.4	≤ 0.0001
field/slide	1	0.1	0.1	0.1	0.8078
treatment	2	24.6	12.3	6.2	0.0025
For/LA	1	4.6	4.6	2.3	0.1329
treatment*f/s	2	17.5	8.8	4.4	0.0136
For/LA*f/s	1	0.5	0.5	0.2	0.6180
For/LA*trt	2	5.9	2.9	1.5	0.2321
Error	253	506.8	2.0		
Total	262	593.7			

**Allegheny National Forest**

The results of an analysis of variance in table 4 indicates again that there is no overall difference between the field and slide ratings of scenic beauty. However, the *t*-tests reported in Table 2 indicate that there is a significant difference between the field and photo ratings for the uncut condition at 64 deer per square mile. This difference may be due to season change (Palmer 1990; Palmer & Sena 1993; Buhyoff & Wellman 1979). Slides were taken in mid-September and the field ratings were made mid-October. In the intervening month, the effects of fall had crept onto these sites changing the appearance somewhat. In the words of the proctor: "there was lots of green fern in the pictures and a lot of brown fern in the woods." The average Pearson correlation between the seven field and slide ratings is .516.

The ANOVA also indicates that both silvicultural treatment and deer density do have a significant impact on scenic value. The Tukey's LSD post hoc test indicates that clearcut areas are significantly more ugly than the uncut and thinned conditions. However, uncut and thinned are not significantly different. The results relating to deer density are not as meaningful, since the controlled conditions are not significantly different and the uncontrolled condition had only a clearcut treatment. However, Tukey's LSD for the clearcut condition indicates that the scenic effects of all three deer densities are significantly different

Table 4. Analysis of variance for the effects of field or slide evaluation, treatment, deer density, and their second order interactions on scenic beautiful at the Fool's Creek Deer Management Area.

Source	df	Sums of Squares	Mean Square	F-ratio	Prob
Const	1	3102.0	3102.0	1521.4	≤ 0.0001
field/slide	1	2.6	2.6	1.3	0.261
deer/square mile	2	48.5	24.2	11.9	≤ 0.0001
treatment	2	159.6	79.8	39.1	≤ 0.0001
d/sm*f/s	2.0	1.4	0.7	0.337	0.7144
treatment*f/s	2	0.1	0.1	0.0	0.965
d/sm*treatment	2	11.6	5.8	2.8	0.060
Error	334	681.0	2.0		
Total	345	946.0			

### Conclusions

The literature reporting results or methods dependent upon photographic representation of forested environments covers a broad range of subject areas. For example, the interaction between visual quality and recreational experiences, the scenic impact of forest management practices, and the effectiveness of various research methodologies in assessing visual quality. Establishing the reliability and validity of photographic media is clearly necessary for the responsible use of this method. In 1974 Shafer and Richards concluded that:

when color-slide or picture presentations adequately depict most of the natural and man-made environments, the adjective-pair measurement of response to the picture presentations agrees favorably with similarly measured on-site responses to the same scenes.

At the same time, experimental results also suggest that if pictorial presentations include only a portion of the total variation in natural environments, responses to such presentations are significantly different from on-site response patterns to the same conditions.

This advice is reinforced by the literature reviewed and results reported in this paper.

Studies looking at testing the validity and reliability of photographic media cite three main concerns regarding the perceptual distortions that occur when a photo or slide is used as a surrogate display. These limitations include context representation, and attribute perception.

#### Context Representation

There are obvious differences in context between a photo or slide of a view and the view as seen on-site. The eye can take in a larger field of view than a photo and is able to focus greater attention to objects of interest. The human eye has a 120-degree lateral cone of vision as compared to the 35mm camera lens used in most visual quality research which has a much more limited 65-degree lateral cone of vision.

In the context visible from the vista viewpoints used for the White Mountain study reported here was breathtaking and much more extensive than the focused views in the simulations. They tended to incorporate this context in their judgment, even when directed to evaluate only the area represented in the photograph. This is clear from their responses to an open-ended question to describe what they saw. While the evaluations of the slides may be accurate in and of themselves, it cannot be claimed that they represent the conditions within this larger context.

#### Attribute Perception

Understanding a site's visual attributes, such as color, lighting, scale, shape, and distances, may not be sufficiently accurate when based on perceptions of a photograph (Shelby & Harris, 1985;

Shuttleworth, 1980). Of course there are additional perceptions that cannot be represented by a visual medium: sounds, smells, tastes, touch, and kinesthetic experience.

A photo or slide is a two-dimensional static image with a very limited depth of field. It is sometimes difficult to photograph the forest because the trees get in the way. It is important view points are not selected for photographic convenience. For instance, care should be taken not to stand in an area that is more open than normal. Care should be taken to obtain maximum depth of field, which may require that a tripod and slower shutter speeds are used. It is also best to take photographs on overcast days with the sun high overhead to reduce the effect of highly contrasting lighting. The image's composition is also a concern. The image should be horizontally accurate and not artistically framed or artificially focused on feature elements. It should become common practice that more than one image be used to represent a site's visual condition. This need is illustrated by the significant difference in ratings for the two slides representing residual slash at Cuyler Hill.

A photograph records the condition of a particular point in time. Palmer (1990) has shown that seasonal change affects scenic evaluation, but that respondents rate the same view differently when it is presented in divergent seasons for evaluation. Researchers must therefore remain cognizant of the importance of changing conditions such as foliage density or color.

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