12-1984

Visual preferences of a forest trail environment

Brian Edward Keyes

To the Graduate Council:

I am submitting herewith a thesis written by Brian Edward Keyes entitled "Visual preferences of a forest trail environment." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Forestry.

William E. Hammitt, Major Professor

We have read this thesis and recommend its acceptance:

David M. Ostermeier, John W. Lounsbury

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Lawrence

The Graduate School

VISUAL PREFERENCES OF A FOREST TRAIL ENVIRONMENT

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Brian Edward Keyes

December 1984

ACKNOWLEDGMENTS

I am especially grateful to the members of my thesis committee for their guidance, support, encouragement, and critical review throughout this project. Special commendations are directed to Dr. William E. Hammitt, Associate Professor, Department of Forestry, Wildlife and Fisheries, who served as my major professor. His patience, dedication to this study, and helpful hand were deeply appreciated. I also wish to express my gratitude to Dr. David M. Ostermeier, Associate Professor, Department of Forestry, Wildlife and Fisheries and Dr. John W. Lounsbury, Associate Professor, Department of Psychology who also provided assistance and served on my committee. Further appreciation is extended to Stan Canter and the interpretive staff at Great Smoky Mountains National Park headquarters for their help in the development and implementation of the project. During the summer of 1982 I was provided with lodging and a place to code questionnaires by the Uplands Research Station in the park. Finally, to my parents, Mr. and Mrs. Charles H. Keyes, goes my deepest appreciation for all their moral support and encouragement throughout my college education.

Financial support for this project was provided by the McIntire-Stennis project-33 and the Carlos Campbell Memorial Research Fund from the Great Smoky Mountains Conservation Association.

ABSTRACT

Recreation resource managers are becoming increasingly aware of the importance of the visual resource to recreationists. Hiking forest trails is an extremely popular recreational activity; however, little information exists concerning how visitors visually perceive forest trails and how resource managers might manage these environments to enhance the benefits derived from a hiking experience. The major objective of the study was to determine the visual preferences of visitors to a forest trail in Great Smoky Mountains National Park in Tennessee. Of particular interest was the relationship of preference and familiarity for various scenes along the trail.

An environmental preference and visual information processing approach underlie the study. A total of 750 visitors were interviewed on-site during the summer of 1982. Although some of the visitors were asked to view photographs of the forest trail environment just prior to their hike, most were shown the photos only upon completing their hike. Visitors were asked to indicate their preference (depending on the treatment) or familiarity (on a 5-point Likert scale) for each photographed scene. Information was also obtained about visitors' past and present hiking experience in addition to other background variables. Photographs for the study questionnaire included some taken by the researcher and some taken by visitors.

Results indicate that although visitors rate most of the forest trail scenes fairly high, they do prefer certain scenes over

others. Highly preferred are scenes containing water, the trail or ravines. In addition, scenes are preferred that contain an element of hidden, but promised information which entices one to enter the scene deeper and to explore it more fully. When the photos were grouped according to patterns of commonalities through factor analytic procedures, the factor that contained scenes of water was the most preferred, while the factor dominated by felled trees, tangled underbrush, or exposed roots in the foreground was least preferred. Four factors or forest trail scene dimensions, in total, were identified by the factor analysis. The "information processing" model used, in addition to the physical descriptions for interpreting the forest trail scene dimensions, showed "complexity" and "mystery" (the promise of more information) to be very important predictors of preference.

Familiarity was shown to be an important component of preference. Scenes visitors rated most familiar were likely to be scenes that rated high on preference. Considerable visual information appears to enter memory as a result of on-site experiences. In addition, interpretive signs, located at certain scenes along the trail, significantly increased preference and familiarity ratings.

Application of the research is directed toward trail planners and interpreters of the forest. Knowledge of which forest scenes and features visitors prefer permits the resource manager to locate trails on a basis other than intuition and geological site characteristics to better meet the needs of recreationists. It also provides a basis for managing the visual resources of forest environments.

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CHAPTER I

INTRODUCTION

Background

Public opinion and, increasingly, legislative mandate require that the visual, aesthetic characteristics of the environment be considered in public land-use decisions. Visual appearance is of crucial significance and probably influences our response to environments more directly and with greater salience than do other senses (U.S. Forest Service, 1973). The National Environmental Policy Act of 1969 calls for management of ". . . aesthetically and culturally pleasing surroundings." Social scientists are concerned with the issue of human visual preference for various landscapes and realize that environmental beauty can influence human well-being (Balling and Falk, 1982). "A landscape is beautiful when it has been or can be the scene of a significant experience in self-awareness and eventual self-knowledge (Jackson, 1975)." Gussow (1979) adds ". . . the landscape is more than a passive backdrop. It is the stage on which we move. The events of life take place somewhere and that "whereness" affects the perception of the event. The environment we see . . . gives shape to our character."

Since visual perception of natural environments is an important component of many recreational pursuits, outdoor recreation managers and planners are seeking better ways to measure people's perceptions

of recreational areas. There is a need for understanding what it is about various components of natural environments that make people prefer certain scenes over others (Brotherton, 1979). People often have very strong feelings about what they like and do not like to see. The value of knowing about environmental preferences can provide a better basis for planning, developing, and managing visual resources to provide and meet the needs of outdoor recreationists (Shafer, 1969).

Arthur and Boster (1976) report that 95% of the papers published in the visual preference field date from 1965. Thus, since this type of research in natural areas is somewhat new, relatively little research has addressed the visual preferences of people for forest trail environments.

Hiking forest trails is an extremely popular recreational activity. Trails are unique since they provide recreationists with a means to enter the forest environment they might otherwise never experience. Thus, trails encourage hiking, but they also are capable of limiting and determining what the visitor is exposed to on his journey (Hammitt and Cherem, 1980). Therefore, the design and layout of trails is important since this focuses and orients hikers' vision toward various components and elements of the forest environment.

The location of hiking trails, campgrounds, and many other recreational facilities is determined primarily on the basis of biological and geological site characteristics. If visual characteristics are involved in the decision-making process, most or all

of the determination is left to the intuition of the resource manager or interpretive specialist. However, research has shown that managers' perceptions of user preferences and actual preferences of users are not synonymous (Clark et al., 1971; Daniel and Boster, 1976; Hendee and Harris, 1970; Merriam et al., 1972; Peterson, 1974; and Twight and Catton, 1975). Hence, the proper trail design is dependent on knowledge of the perceptions and preferences of potential visitors to that site. Input on the patterns, components, and features which are preferred by visitors to a recreational environment needs to be incorporated into the planning process when possible (Kaplan, 1980). "Given that humans are visual organisms, we can thus hypothesize: if information is processed primarily by a visual mode, should we not look toward this same mode as a means for extracting information acquired?" (Hammitt, 1978).

Statement of Project

Purpose and Objectives

The general purpose of this study was to identify patterns, components, and possible features of the forest trail environment which are preferred by visitors as a result of an on-site experience. Information concerning the type of forest trail scenes and features visitors prefer can be quite beneficial to recreation resource managers in planning, developing, and managing recreation areas to best meet the needs of their visitors.

Specifically stated, the objectives of this project were:

1. To determine, through visual preference methodologies, the patterns, components, and features which are preferred by visitors to forest trail environments during recreational engagements.
2. To assess changes in patterns of visual preference as a function of contact with forest environments.
3. To determine the relationships between visual preference and familiarity ratings for forest trail scenes.
4. To observe the effect of interpretive signs placed along the trail, past visitor experiences, trail behavior information, and certain background characteristics on visual preference and familiarity ratings.
5. To suggest ways in which the visual preferences of recreationists can be incorporated into the planning, developing, and managing processes of recreation resource management.

Approach

The approach utilized a photo-questionnaire to survey visitors' visual preferences for a forest trail environment in Great Smoky Mountains National Park. A total of 750 visitors were interviewed on-site during the summer of 1982. Respondents were asked to rate forest scenes for either visual preference or familiarity. Photographs for the study included some taken by visitors and some taken by the researcher. A pre-post and control sample design was used in the on-site survey.

Additional information obtained from respondents included past hiking and visitor experiences, behavioral information while hiking the trail, and background characteristics that may be related to visual preference and familiarity ratings.

The conceptual and theoretical framework upon which this study is based assumes that man is an information processing organism of his environment. This approach, which is presented in the next chapter, provides a basis for looking at visitors' preferences and leads to general and specific management implications and applications.

CHAPTER II

THE CONCEPTUAL APPROACH

An Evolutionary Basis

For most of his existence as a species, man has been a hunter and gatherer evolving in a natural environment of danger and uncertainty. In order to survive, man had to be skillful in anticipating what would happen next in order to capture game and to avoid danger. His ability to efficiently handle environmental information helped him to reduce the uncertainty and danger of an environment to a predictable level. The planning and anticipating required for survival favored the development of a larger and more flexible information-handling capacity (S. Kaplan, 1973a).

As a hunter and explorer, particularly in the African savanna, man would have had to acquire a great amount of knowledge concerning a large territory or habitat. Any organism that was mobile and interested in exploring and acquiring information concerning its environment, would appear to have been at an adaptive advantage. Familiarity with a wide range of options gave early man the ability to act from information and not ignorance (S. Kaplan, 1973a).

Central to man's information-processing for survival purposes would have been the development of an efficient perception and decision-making process. He would have to be constantly alert as he moved through various environments to make split-moment decisions

concerning his actions. An increased sense of familiarity for a territory would certainly seem to be a preferred situation. Millions of years of evolution in natural environments would have selected for efficient information processing capabilities in man.

Today, man utilizes the same basic information processing machinery he used in the past. Although man is no longer truly preoccupied with the concerns for survival, "The removal of urgent necessity does not put an end to the machinery which evolved to cope with it; rather it frees that machinery to achieve different objectives which themselves are constantly changing with the aspirations and caprices of society (Appleton, 1975, p. 169)." Indeed, man still finds himself today in the need of exploring, seeking, and processing tremendous amounts of environmental information.

Cognitive Maps

It has been proposed that man, through the processes of evolution, has developed a sophisticated "piece of machinery" for handling environmental information. Properties of the machinery and mechanisms must allow for: an efficient and almost spontaneous perception of the environment; a tremendous storage and retrieval system of information stored in the head; and a flexible information processing procedure that allows for the incorporation of new information as well as activation of the old (S. Kaplan, 1973b).

The cognitive map theory has been proposed as a model of how man experiences and knows his environment. It has been summarized by Stephen Kaplan (1973b) as follows:

> The cognitive map is a construct that has been proposed to explain how individuals know their environment. It assumes that people store information about their environment in simplified form and in relation to other information they already have. It further assumes that this information is coded in a structure which people carry around in their heads, and that this structure corresponds, at least to a reasonable degree, to the environment it represents. It is as if an individual carried around a map or a model of the environment in his head. The map is far from a cartographer's map, however. It is schematic, sketchy, incomplete, distorted, and otherwise simplified and idiosyncratic. It is, after all, a product of experience, not of precise measurement (p. 276).

Past experience and familiarity with one's environment is central to cognitive map theory. Those organisms who were restless, who loved to explore, and who cared to know would have been extending their cognitive map building experiences. In addition, they were better equipped for survival.

Perception is an integral part of the cognitive map-building process. We perceive stimuli from an environment based on the internal cognitive representations coded in our head, which have been formulated through previous experiences. Thus, perception "forms" the cognitive map and the cognitive map "forms" perception (Hammitt, 1978).

For our purposes, a cognitive map can be conceived as a coded, neurological network that consists of abstract representations of the external world. These "representations" are not only of objects within the environment, but include sensory impressions and emotional feelings as well. This illustration of environmental cognition serves to explain how a person can look at a photographic image of an environmental scene he experienced in the past and now with adequate

accuracy recall the fragrance of the fir trees, the howling of the wolves, the coolness of the wind and snow, and how much he enjoyed the area. Thus, perception of the visual photograph matches the external environment with the internal representations formed from the past experience associated with the environment and others similar to it.

Information Processing and Visual Preference

S. Kaplan has theorized that the same informational needs of man for survival are also informational components of preference. An environment or scene that contains pertinent informational content, and also lends itself to ready interpretation will be an environment most likely to be preferred.

"Clarity" is of crucial importance to man's processing of environmental information (S. Kaplan, 1977). An environment that did not confuse man, one which he would be able to make predictions and expectations about, would likely be ideal and preferred. As man increased his exploration activities and thus expanded the structure of his cognitive map, the unknown became known, and the clarity and associated preference for his environment increased.

S. Kaplan (1975, 1977), reasoning from the evolutionary need to process environmental information and cognitive map theory, has proposed an informal model of landscape information variables to be used for the prediction of environmental preference. Kaplan argues that "an organism, like man, whose survival is based on

knowledge would have to like acquiring new information" provided he can control (organize and understand) it. Thus, landscape variables such as complexity, mystery, and spaciousness, providing they are "identifiable" and "coherent," are preferred since they supply the promise of additional information. To survive as the fittest (in evolutionary terms), man has been selected to continually acquire new, understandable information. Kaplan uses similar reasoning in determining that environments humans prefer must be:

1. environments one can make sense of;
2. environments that offer novelty, challenge, and uncertainty (to an extent); and
3. environments that permit choice.

He also acknowledges that it is somewhat of a squeeze to explain all human visual preference on the basis of a single variable. There is much interacting taking place.

It would seem logical to discuss in more detail the landscape variables presented by Kaplan:

Spaciousness

In a scene with a high degree of spaciousness, the elements of the scene can be recognized and can be organized into a coherent pattern for clear interpretation (Lynch, 1960). The scene will likely contain a pattern of high continuity with distinctive parts, clearly interconnected or related in a clear manner for viewing. An example of spaciousness in the forest would be an opening created by a ravine.

Kaplan discusses spaciousness in terms of identifiability and coherence. Distinct features, sharp boundaries, patterns of texture, and redundancy in a landscape facilitate identifiability. Coherence depicts how the elements of the scene relate or "hang together." Together identifiability and coherence provide overall organization to the informational array of the scene.

Complexity

Opportunities for cognitive involvement are characteristic of those scenes which are rich and diverse. Scenes with variety and a large number and degree of proportional relationships of visual elements can be said to be complex. When there are more things to look at and more relationships to infer, complexity encourages cognitive awareness or involvement. But, as Wohlwill (1976) and Hammitt (1978) have noted, too much complexity could lead to ambiguity or lack of clarity.

Mystery

Mystery is concerned with the promise of gaining additional information as one enters a scene. In a complex or spacious scene, all of the potential cognitive information is visible, but additional time and inspection are required to interpret the information. In those scenes where the mystery variable is acting, the opportunity to explore and proceed further into the scene to gain new and hidden information is readily available and even inviting. A bend in the trail, an opening in dense foliage permitting inspection, or a large

mass of vegetation at the edge of a scene that entices one to walk around it to learn more all increase the sense of mystery (Hammitt, 1978, 1980a).

Based on the conceptual approach that man is an information processing organism, that the visual elements of scenes are important for cognitive map formation, and that the content of these scenes has information variables which can be used to predict environmental preferences; a visual preference approach using photographs was selected to determine recreationists' perceptions of a forest trail environment.

Use of Photographs as a Medium for Measuring Visual Preferences

This study utilized photographs to investigate recreationists' perceptions for a forest trail environment. It becomes expensive and difficult to transport recreationists to the actual landscapes being studied. Practical problems of organization become immense and it becomes impossible to take the number of respondents which are statistically necessary for social survey approaches around to all the study landscapes (Dunn, 1974). In view of these practical difficulties, most landscape researchers have been deterred from using on-site surveys of the environment. Thus, some technique which can accurately represent landscapes by using a surrogate convenient for large scale social survey approaches is needed. In this respect, the use of photographs in recent work concerned

with environmental aesthetics, perception and preferences has been commonplace, because photographs can be used with greater economy, speed and control than can real-world situations (Shuttleworth, 1980).

Whether or not photographs actually represent landscapes and the issue of validity has been discussed by several researchers. Shafer and Tooby (1973) and Shafer and Richards (1974) found that a photograph can measure on-site preference for a landscape, if the photographic presentation contains most of the visual variation found in the actual landscape. Daniel and Boster (1976) found high correlations between people's reactions to photographs and actual on-site visits ($r = .98$ and $r = .97$ in two separate tests using colored slides). The use of black and white photographs as representative simulations of natural environments for preference rating research is also supported by both theory and experience (R. Kaplan, 1972, 1974; and Kaplan, Kaplan and Deardorff, 1974). Their results have been quite reliable, valid, and intuitively meaningful across a broad selection of environments and groups.

If, through information processing, people do formulate cognitive maps of the environment, based primarily on visual experiences, then one might conclude that on-site experiences could be important in the perception of such environments. Since much of the on-site information is processed visually, the use of photographs would appear to be an appropriate approach for abstracting what recreationists do perceive and feel strongly about during on-site experiences.

The use of photographs can, in a sense, be seen as a mechanism to "trigger" or call-up visitors' mental images of the visual environment which they experienced while on-site.

Individuals' preference ratings for photographs of an environment should indicate what patterns, features, and components of that area interest people. This information is used as the core or primary data base for this research project.

CHAPTER III

STUDY SITE AND RESEARCH METHODOLOGY

Study Site

The location of the on-site visitor survey for this study was the Trillium Gap Trail in Great Smoky Mountains National Park, Gatlinburg, Tennessee. The trailhead is located between postmarkers 5 and 6 along the Roaring Fork Motor Nature Trail, a one-way, looped road which offers visitors access to a heavily-forested environment via their automotive vehicles. At the Trillium Gap trailhead the road opens up into a large parking area enticing visitors to hike the trail.

The Trillium Gap Trail is a heavily used trail, measuring 3-miles round trip; it normally requires about one hour and a half to hike. Grotto Falls, a popular 15 to 20 foot waterfall is the major destination of the trail. The trail crosses several tributaries from the falls as it winds its way through a virgin cove hardwood-hemlock forest typical of the Appalachian Mountain region.

The Trillium Gap Trail was chosen for this study because of the diversity of the trail environment, its heavy visitor use (enabling the generation of an adequate sample size), and its low hiking difficulty rating given by the National Park Service. A longer or steeper trail with a higher difficulty rating would likely not receive as much use and attract only the more experienced hikers.

It was thought that the Trillium Gap Trail would generally attract the average type of hiker, as well as those with low or high hiking experience.

Research Design

This study was designed to interview visitors at the trailhead before or after their hike. The sampling station consisted of a cardtable, chair, and sign. Visitors could not enter or leave the trailhead without passing the survey sampling station.

A questionnaire consisting of photographs of the forest trail environment and some printed material was used to survey visitors. The study was designed to answer several research questions:

1. How will visitors rate photographs of a forest environment for visual preference prior to their on-site hiking experience?

2. How will visitors rate these same photographs for visual preference after they have been exposed to the scenes while hiking the trail?

3. In addition, how will visitors rate the photographs for familiarity (to what extent do they recall having seen that scene on their hike)?

4. When interpretive signs are placed along the trail, will this affect the visual preference and familiarity ratings for the forest scenes?

To answer these questions the study was designed into five treatments. One hundred and fifty individuals were sampled within each treatment. The research paradigm is depicted in Figure 1. In treatments I, II, and IV, visitors rated scenes for visual preference. Visitors participating in treatment I rated photos prior to their hike of the trail. Treatments III and V dealt with visitors' familiarity

Treatment	n	Pre-hike	On-Site Experience	Post-hike
I	150	P		
II	150			P
III	150			F
IV	150		Signs	P
V	150		Signs	F

P = Visitors rate photos for visual preference.

F = Visitors rate photos for familiarity.

Figure 1. The research paradigm.

ratings for the forest trail scenes. In treatments IV and V the visitors were exposed to interpretive signs along the trail. Wooden casings were installed in the ground so signs could easily be removed on sampling days when they were not to be present.

A comparison of the data from treatments I and II will provide insight as to whether the on-site experience is able to affect the manner in which visitors rated preference for the forest trail environment. Results from treatments II and III will attempt to answer questions 2 and 3 above. Question 4 will be answered by results from treatments IV and V.

Questionnaire Development and Instructions

A major concern in the development of a visual questionnaire is the generation of a representative and unbiased set of photographs. Thus, two sources were utilized in generating the 32 photographs for the study: the visitors and the researcher.

Cherem and Traweek (1977) developed a methodology for studying visitor responsiveness to nature trail environments which they term "visitor-employed photography" or VEP. By giving visitors instamatic cameras at the trailhead and asking them to photograph anything in the landscape of interest during their hike, the researcher can reduce his bias of selectively choosing which photos to include in the questionnaire or survey. In addition to his own collection of representative photos of the study landscape, the researcher should include some photos which are "universally" preferred by several visitors.

During the summer of 1981, twenty-four visitors to the Trillium Gap Trail were given instamatic cameras and asked to photograph 12 scenes along the trail they found pleasing. In addition, hundreds of photos were taken by the researcher in order to capture the diversity among the visual and landscape components of the forest trail environment. Photos were chosen from the VEP technique if 6 or more visitors photographed that scene. Of the 32 photographs selected and printed in the questionnaire, 14 were generated through Cherem's VEP technique and 18 were selected from the researcher's inventory to accomplish the diversity needed amongst the photographs.

The 32 black and white photos were printed 2x3 in., eight per page, and randomly placed on heavy-duty white paper, offset for clear visibility. The layout and construction of the questionnaire included an attractive lime-green cover, a page of instructions, 4 pages of photos, and 3 pages of written questions (Plate 1, In Pocket).

Sampling Procedure

Questionnaires were handed out to respondents at the on-site sampling station near the trailhead. They were instructed to quickly preview the photographs to get a general feeling for what they were about and then to indicate their preference for each of the 32 photos directly on the questionnaire by circling one of the five rating numbers below each photo. A 5-point Likert rating scale was used asking visitors to rate "each of the following photographs as to how much you like it" (1=not at all; 2=a little; 3=somewhat; 4=quite a bit; and 5=very much).

In some cases, visitors were asked to indicate how familiar the forest trail scenes seemed to them. Naturally, this was done only after they had hiked the trail. Like the preference ratings, visitors were instructed to quickly preview the photos and then rate them on a 5-point Likert scale "as to whether it seems familiar to you--because you recall having seen that actual scene on your hike" (1=definitely not familiar--5=definitely familiar).

In addition to the "preference" and "familiarity" ratings of photographs, all participants were asked to complete some questions concerning their hiking experience and behavior while on the trail. These questions included items dealing with the number of years spent hiking nature trails in general; the number of years spent visiting or hiking trails in Great Smoky Mountains National Park (including Trillium Gap Trail); the amount of time it took them to hike the trail; and how many and what subject matter was included in the photos they may have taken while hiking through the forest.

Some background questions were also included with items relating to residence, age, group size, education, occupation, and number of children in party below 16 years of age (A copy of the written material can be found with the visual materials in Plate 1, In Pocket).

All written portions of the questionnaire were pre-tested during May of 1982. About 30 questionnaires were pre-tested and appropriate changes made before the actual conducting of the survey.

The sampling was accomplished by the researcher during the months of July and August in 1982, in which 750 hiking parties were interviewed (150 per treatment). Treatments were randomly assigned among sample days, although the weekend days were sampled more heavily in acordance with higher visitation estimates supplied by the National Park Service. July 4th, a holiday, was not included as a sampling day. A maximum of 38 hiking parties were sampled each day to allow for diversity among treatment days. One hiking member from each party or group was asked to fill out the questionnaire at the trail-head after he or she had finished hiking the Trillium Gap Trail to Grotto Falls and back. All respondents were 16 years of age or older.

Interviewing usually began at 11:00 a.m. and continued until 38 questionnaires were completed. On busy sampling days, an effort was made to evenly space the interviewing between 11:00 a.m. and 5:00 p.m. Trail use before and after this period was fairly light. Several sampling days had to be rescheduled due to adverse weather conditions.

Very few refusals to fill out the questionnaire were encountered. Refusals per sample day ranged from 0 to 2, with an average of 0.70. Most respondents seemed to enjoy rating and viewing the photoraphs and offered constructive comments concerning their preference opinions and the objectives of the project. Several families even requested extra copies of the questionnaire as a photographic souvenir!

All questionnaires were examined for completeness after they were turned in and the respondents had left the study area. If four or more items on the questionnaire were left blank, the questionnaire was dropped from the sample and not counted for that day. Less than thirty questionnaires fell into this category during the entire study period.

Data Analysis

All photographs with visual preference ratings were factor analyzed to determine what visual themes or dimensions existed in the trail environment. Principal Factoring with Interaction and Orthogonal/Varimax Rotation from SPSS (Nie et al., 1975) was used for the factoring. Criteria used in selecting factors were: factor loadings had to be greater than 0.40 for items to be included in a factor; if a photograph appeared in two factors, it was placed in the factor in which it loaded the highest; only factors with eigen values greater than or equal to 1.0 were extracted, and the reliability coefficient (Cronbach's alpha) of each factor had to be near 0.60 or greater for it to be retained (Nunnally, 1967). Once factors were determined, factor means were computed and used as a basis for interpreting the visual preferences of trail users.

In addition, within each treatment (including treatments III and V which dealt with familiarity ratings), mean scores and standard deviations were computed for each photograph and background variable, so appropriate statistical tests (t tests and Chi-square) could be applied to make comparisons between treatments.

CHAPTER IV

VISITOR CHARACTERISTICS

Background variables, which are used to describe the sample population, are basic to most questionnaires. The findings from these variables are normally presented near the end of the results section. However, it seems more appropriate to describe the participants of the study prior to a discussion of the major findings. Knowing the visitor characteristics beforehand should aid the reader in interpreting and understanding the data.

Visitors to the Trillium Gap Trail, in Great Smoky Mountains National Park, Gatlinburg, Tennessee, have for the most part, traveled a considerable distance. Regional use of the trail, defined as those visitors who have traveled 150 miles or less to the park, constituted only 10% of the total sample. Two thirds or 66% of the sample traveled a distance greater than 400 miles to visit the park. Most visitors are from Tennessee (15%); however, a considerable portion are from either Florida (11%), Ohio (10%), Michigan (7%), Illinois (6), Indiana (5%), or Kentucky (4%). North Carolina, a border state of Great Smoky Mountains National Park, surprisingly accounted for only 2% of the respondents. Evidently North Carolinians choose to focus their visitation on the eastern and south sides of the park.

Since the "Smokies" are more of a national recreation resource than a regional one, only 12% of the hikers to the Trillium Gap

Trail were repeat visitors. In a study of this nature, repeat visitation is an important variable to observe. However, in this project, since all treatments comprise approximately 88% first-time visitation, the variable repeat-visitation did not lend itself toward statistical analysis due to a small sample size.

The majority of the respondents were middle-aged with 62% in the 25 to 45 age bracket. More than a third of the sample was between the ages of 25 and 35 years. Most of the visitors grew up in a city or large suburb of a city. Less than a third of the sample indicated that they grew up in an area with a population of 2,500 or less (a small town, in the country, or on a farm or ranch). Educationally, 70% of the sample reported schooling beyond high school. In terms of occupation, 16% of the sample responded as students, 10% as housewives, and 50% with jobs receiving an above average ranking on a job status scale (Nam et al., 1975). Thus, hikers on the Trillium Gap Trail are above the national norm in terms of education, occupation, and other status measurements.

Most people visited the Trillium Gap Trail in groups. Only 2% of the respondents hiked the trail alone. The most common group size was two (35% of the sample). Over four-fifths of the sample consisted of groups with two to five individuals. Slightly less than half of the groups visited the trail with children less than 16 years of age (36% of the groups included 1 or 2 children).

CHAPTER V

VISUALLY PREFERRED THEMES

Within this chapter a discussion is presented on the visually preferred scenes of the forest trail environment of Trillium Gap Trail. Then, using the preference data, the photographs are grouped or dimensionalized to determine commonalities or themes among the scenes. These themes are then interpreted from a descriptive and from an information processing approach to identify certain variables which might be acting as environmental preference predictors in the forest trail environment.

Visual Preference Ratings

Thirty-two forest trail scenes were rated by 150 respondents at the conclusion of their on-site hike (Treatment II). The overall mean rating for the photographs was 3.66, on a 5-point scale. The mean scores for the scenes ranged from a low of 2.27 to a high of 4.91 (Table 1). Thus, the scores are skewed toward the upper end of the scale, indicating a positive response to the environment.

What types of scenes do visitors respond to most favorably in the forest trail environment? While it is not practical to look at all 32 photographs individually, it does seem worthwhile to examine the most and least preferred scenes to see if some patterns do exist.

Four of the eight most preferred scenes are presented in Figure 2 (All photographs used in this project are displayed with

Table 1. On-site Preference Ratings for Forest Trail Scenes.[a]

Photograph No.	Preference Rating Mean	Rank of Means and Photos Mean	Photo No.
1	4.00	4.91	19
2	3.07	4.80	17
3	3.15	4.76	28
4	3.63	4.28	8
5	2.86	4.18	32
6	3.73	4.09	12
7	3.88	4.00	1
8	4.28	3.96	21
9	3.77	3.88	7
10	3.02	3.86	30
11	3.36	3.83	15
12	4.09	3.77	9
13	3.51	3.77	23
14	3.63	3.75	18
15	3.83	3.73	6
16	3.16	3.66	24
17	4.80	3.63	14
18	3.75	3.63	4
19	4.91	3.55	31
20	3.29	3.51	13
21	3.96	3.43	27
22	3.19	3.36	11
23	3.77	3.33	26
24	3.66	3.29	20
25	2.27	3.22	29
26	3.33	3.19	22
27	3.43	3.16	16
28	4.76	3.15	3
29	3.22	3.07	2
30	3.86	3.02	10
31	3.55	2.86	5
32	4.18	2.27	25

[a]Based on questionnaire ratings from Treatment II. ($\bar{x}$ = 3.66, N = 150)

Photo 19 $\bar{x}$ = 4.91

Photo 8 $\bar{x}$ = 4.28

Photo 12 $\bar{x}$ = 4.09

Photo 21 $\bar{x}$ = 3.96

Figure 2. Four of the eight most preferred forest trail scenes based on preference ratings.

the written portions of the questionnaire in Plate 1, In Pocket). Photo 19 was the most preferred scene in the study. It depicts Grotto Falls, the destination of the trail. Four of the five most preferred photographs all contain water. Evidently water is a highly preferred component of natural environments. This has been shown in other visual preference research (Shafer and Brush, 1977; Zube, 1973; Zube et al., 1974).

Photographs 8, 12, and 21 all are scenes of the trail winding through the forest. A distinct bend in the trail is present and due to the visual barrier caused by the forest's dense vegetation, the hiker's view of what might be around the corner is obscured. Hammitt (1980a) theorized that such scenes encourage hikers to become visually involved, to walk around the bend in the trail to view the hidden, yet promised information. The preference for hidden, yet promised visual information by simply changing one's viewing station, is termed mystery. Hammitt found that hikers to a bog environment in West Virginia visually preferred those scenes with a mystery component over others. In addition, visual preferences for scenes involving a mystery component are not limited to natural environments (Cullen, 1961; Lynch, 1960).

Basic to understanding the preferences for scenes involving mystery is a functional knowledge of environmental perception and preference. A major objective of perception is oriented toward "knowing" the environment one is required to operate within (S. Kaplan, 1975). As stated previously, human success as an

organism has been heavily dependent on man's knowledge of the informational content of his environment. An environment which is spacious; which contains more perceptual information than another; or one in which part of the information is hidden, would require humans to become involved in order to know it (Hammitt, 1978).

Humans tend to value the opportunity to gain new information about an environment. Environmental scenes that indicate a possibility for exploring, both visually and mentally, for additional information, offer a challenge to viewers which they prefer (Hammitt, 1978). Diversity, complexity, and mystery are all informationally oriented, and have been shown to be strong predictors of environmental preference (S. Kaplan, 1975; Lynch, 1960; Wohlwill, 1976). In this study, scenes which did not include prominent features, such as water or unique vegetative forms, were rated higher if they were more diverse, complex, or included a mystery component.

The least preferred scenes appear to be more consistent in general appearance than the most preferred scenes. The four least preferred scenes are presented in Figure 3. Photos 25, 5, and 10 all contain some form of disturbed vegetation. The scenes appear chaotic and unorderly; clarity and coherence are lacking. Apparently a substantial amount of exposed roots, felled trees, or tangled underbrush, if the focal point of a scene, is not preferred by visitors to the trail. This supports the findings of Benson and Ullrich (1981).

Photograph 2 is likely not preferred due to the absence of diversity, complexity, and a sense of mystery in the scene. Further

Photo 25 $\bar{x}$ = 2.27

Photo 5 $\bar{x}$ = 2.86

Photo 10 $\bar{x}$ = 3.02

Photo 2 $\bar{x}$ = 3.07

Figure 3. Four least preferred forest trail scenes based on preference ratings.

aspects of the least preferred components of the forest trail environment will be discussed in later portions of this chapter.

Visual Preference Themes

It is of little value to the resource manager to know preferences for individual scenes. It is much more practical to manage for patterns or landscape themes in environments. Thus, the factor analysis technique is used in this study to group scenes with inherent similar themes or informational content.

Table 2 depicts how the factor analysis grouped the photographs into four dimensions of forest trail scenes. Criteria for determining the factors can be found in Chapter III. The themes identified by the factor analysis are included in Figures 4 through 7. Each of the factors or dimensions has been given a name according to a general theme that characterizes it.

Themes (Dimensions)

The "WATER" dimension (Figure 4) includes three scenes which contain various views of the stream from the trail. The scenes are characteristic of typical stream environments in the forests of the Appalachian Mountains. Rhododendron (Rhododendron maximum) flourishes alongside large rocks as the water rushes by. These scenes appear to be quite complex and diverse in nature. The overall preference mean (4.58) for this dimension was easily the highest of the four dimensions generated by factor analysis.

The "TRAIL" dimension consists of fourteen scenes dominated by the presence of the trail. Six representative scenes from this

Table 2. Forest Trail Scene Preference Dimensions Based on Factor Analysis of Photo Ratings from Treatment II.

	Factor Analysis Results	Loadings	Alpha Value
Dimension 1 "Water"	Photo 32	.6223	.561
	Photo 28	.6153	
	Photo 17	.4629	
Dimension 2 "Trail"	Photo 7	.7610	.896
	Photo 23	.6890	
	Photo 8	.6613	
	Photo 12	.6379	
	Photo 21	.6093	
	Photo 15	.6019	
	Photo 26	.5961	
	Photo 22	.5787	
	Photo 31	.5780	
	Photo 4	.5732	
	Photo 1	.5351	
	Photo 14	.5221	
	Photo 9	.4436	
	Photo 27	.4023	
Dimension 3 "Ravines"	Photo 18	.6901	.702
	Photo 2	.5612	
	Photo 30	.4301	
	Photo 24	.4077	
Dimension 4 "Foreground Cluster"	Photo 16	.7867	.883
	Photo 25	.7157	
	Photo 3	.6849	
	Photo 20	.6847	
	Photo 5	.6646	
	Photo 13	.6404	
	Photo 10	.5967	
	Photo 6	.4855	
	Photo 29	.4370	

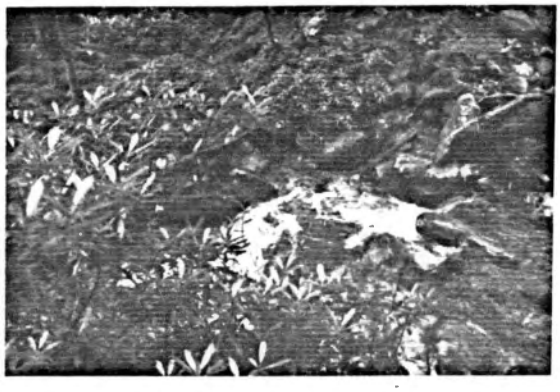


Photo 32 $\bar{x}$ = 4.18

Photo 28 $\bar{x}$ = 4.76

Photo 17 $\bar{x}$ = 4.81

Figure 4. Photo dimension 1--titled "WATER."

Photo 8 $\bar{x}$ = 4.28

Photo 12 $\bar{x}$ = 4.09

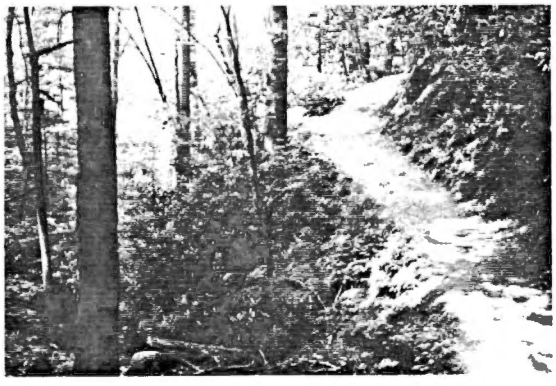


Photo 21 $\bar{x}$ = 3.96

Photo 31 $\bar{x}$ = 3.55

Photo 14 $\bar{x}$ = 3.63

Photo 27 $\bar{x}$ = 3.43

Figure 5. Photo dimension 2--titled "TRAIL."

Photo 18 $\bar{x}$ = 3.75

Photo 2 $\bar{x}$ = 3.07

Photo 30 $\bar{x}$ = 3.86

Photo 24 $\bar{x}$ = 3.66

Figure 6. Photo dimension 3--titled "RAVINES."

Photo 25 $\bar{x}$ = 2.27

Photo 3 $\bar{x}$ = 3.15

Photo 20 $\bar{x}$ = 3.30

Photo 13 $\bar{x}$ = 3.51

Photo 10 $\bar{x}$ = 3.02

Photo 6 $\bar{x}$ = 3.73

Figure 7. Photo dimension 4--titled "FOREGROUND CLUSTER."

landscape theme are depicted in Figure 5. In fact, every scene utilized in the study which contained a view of the trail factored along this dimension. The trail seems to be an important aspect of the recreational experience, since it affords entry into environments that appear "blocked," yet desirable, to penetrate. Those scenes which seemed to include a sense of "mystery" rated the highest in the dimension. Photos 12 and 21 appear to include a higher degree of mystery than photos 31 and 27. The TRAIL dimension received a mean preference score of 3.76.

The "RAVINES" dimension (Figure 6) is made up of four scenes, views of a ravine from the trail. A ravine can be defined as an area where two slopes meet to form a concave-shaped landscape (often worn by a stream). Photo 24 is a view across a ravine (from one slope to the other). These areas create openings in the forest. This spatial phenomenon, indeed, was preferred by visitors. The RAVINES dimension (3.60) was preferred slightly less than the TRAIL dimension, in terms of its mean preference score.

Figure 7 depicts six typical scenes from the "FOREGROUND CLUSTER" dimension. A total of nine scenes factored in this dimension. In each scene the presence of naturally felled timber, exposed roots, or tangled underbrush dominates the foreground. These scenes appear to block the visitor's entry into the scene. There is little visual affordance in these scenes when compared to the other scenes used in the study. The visual preference score for the FOREGROUND CLUSTER dimension was the lowest of the four (3.13).

Photograph 19, a centered, close-up view of Grotto Falls, the major destination of the Trillium Gap Trail and the most preferred scene in the study ($\bar{x}$ = 4.91), and Photograph 11, a view of the trunk of a silverbell tree (Halesia caroliniana) did not factor in any of the four dimensions identified by the factor analysis. This is thought to be due to the two photos' inherent uniqueness quality. They are unlike all other photos in the study. There is no other major waterfalls along the Trillium Gap Trail and no other photo of the side of a tree trunk.

The four dimensions, although grouped thematically, overlap to some extent in terms of preference ratings. However, the mean preferences for the four dimensions are statistically significant, and thus, distinctly different. Table 3 shows these means for each of the dimensions and the statistical significance of the difference between adjacent dimensions. The dimensions are meaningfully different and help identify distinct themes and/or dimensions in the forest trail environment.

Table 3. Comparison of Dimension Preferences (n = 150).

Dimension	Mean		t Value	Significance
WATER	4.58			
		>	14.26	.000
TRAIL	3.76			
		>	2.72	.007
RAVINES	3.60			
		>	7.59	.000
FOREGROUND CLUSTER	3.13			

Informational Analysis of the Dimensions

The physical descriptions of the forest trail dimensions provide a basis as to what visitors prefer to see; however, it is important to understand why they prefer certain scenes over others. Interpreting the dimensions from an information processing viewpoint (presented in Chapter II) will help explain peoples' preferences and should reveal some predictors of visual preference operating within the dimensions.

The scenes comprising the WATER dimension rate high in clarity. They tend to be spacious, rich and diverse. The viewer is enticed to become more cognitively involved with images of water rushing past unique arrangements of moss-covered rocks, logs and vegetation. The motion and "focal point" perspectives of the stream are likely aspects which capture the hiker's attention. The attractive nature of water as a feature in the forest environment together with its spacious and complex surrounding environment cause scenes in the WATER dimension to be highly preferred.

The TRAIL dimension is quite high in both immediate and promised information. A view of the trail winding its way through the forest is coherent and legible. The trail itself acts as an identifiable element. In all the TRAIL scenes, the trail adds order, focus, and predictability to the hiker's experience.

In addition, the TRAIL scenes rate high on "involvement." The forest habitat is ever-changing as one walks the trail in ascent

of the mountain. A diversity of elements and habitats await the curious hiker and offer more information upon additional inspection. In particular, the intriguing urge to walk around a bend in the trail or a large mass of dense vegetation at the edge of a scene is an important element that predicts the greater preference for this dimension. An information-processing organism prefers scenes which offer the promise of additional information or "mystery."

The element of "change," especially when it is distinctive, attracts man's attention. "As the unknown becomes known, the flow of perceived environmental stimuli repetitious, then, it is change that often attracts attention and offers new involvement" (Hammitt, 1978; 1980a). The desire to walk around the bend in the trail (photo 12) or to proceed forward through the thick vegetation (photo 14) is underlaid with a promise of additional and different information upon further observation. Such scenes are appealing in terms of cognitive map formation.

The scenes of the RAVINES dimension are high in complexity and spaciousness. When two slopes meet in a "V," an opening is formed in the forest where many diverse vegetative units aggregate. These rich, but organized, scenes are pleasing to the eye. The spaciousness of the views offers the visitor a wealth of information for cognitive map formation. In addition (see photo 30), the joining slopes of the ravine may form a pleasing vista for the hiker's viewing (in short, a "trail" for the eye).

Although some scenes contain some complexity offered by felled timber and vegetation arrangements, the FOREGROUND CLUSTER dimension

offers little coherence and predictability for the viewer. Unlike the scenes in the TRAIL dimension, the viewer is not compelled to enter into the scene. No clear-cut path or trail is present to provide entry or easy access through the scene. Usually, and especially in the least preferred scenes, felled trees, exposed roots, or tangled underbrush dominate the view. The hiker's hopes of gaining additional information is, in a sense, "blocked visually" by the presence of disturbed vegetation. Coherence or visual unity is quite absent in these scenes.

Preference Ratings of Photographs Prior to Hike

The preceding discussion of the visual preference dimensions was based on data from Treatment II. In that treatment, visitors rated scenes for visual preference "after" they hiked the trail. In Treatment I visitors rated the scenes for preference "before" they hiked the trail, before they had the opportunity to view the scenes "on-site."

The on-site experience was quite influential on visitors (Table 4). Preferences strongly tended to increase for scenes after visitors had hiked the trail (Treatment II). All but three of the scenes' mean preference scores were higher after visitors viewed the scenes on-site. Fourteen of the thirty-two photographs had statistically significant increases ($p \leq .10$, Student's t test). One could speculate that the lower ratings that occurred "before" the hike, were due to the photographs not representing the actual

Table 4. Mean Preference Ratings and Rank Position of Photographs Viewed Before or After Hike.

T_1	T_2	t test	Photographic Rank	
Before	After	Significance	Before	After
4.91	4.91		1	1
4.81	4.81		2	2
4.53	4.76		3	3
4.09	4.28		4	4
3.96	4.18	.058	5	5
3.92	4.09		6	6
3.85	3.96		7	8
3.84	4.00		8	7
3.81	3.85		9	10
3.69	3.75		10	14
3.69	3.66		11	16
3.60	3.77		12	12
3.57	3.83	.015	13	11
3.55	3.73		14	15
3.51	3.77	.013	15	13
3.48	3.88	.002	16	9
3.46	3.63		17	17
3.44	3.63		18	18
3.27	3.51	.053	19	20
3.25	3.30		20	24
3.23	3.43	.100	21	21
3.13	3.22		22	25
3.11	3.55	.001	23	19
3.09	3.36	.036	24	22
3.08	3.16		25	27
3.07	3.15		26	28
2.97	3.33	.004	27	23
2.91	3.07		28	29
2.86	3.19	.012	29	26
2.61	2.86	.051	30	31
2.39	3.02	.000	31	30
2.13	2.27		32	32
$\bar{x}$ = 3.46	$\bar{x}$ = 3.66		rho = .96	

on-site visual environment. There is evidence to suggest that this was not the situation.

First, the "before" rating scores for photographs, even though lower than the "after" ratings, were still fairly high ($\bar{x}$ = 3.46). This would suggest that visitors could interpret the photos and had no problem in relating to the scenes. Secondly, when the mean scores for the "before" and "after" visitors were ranked from high to low (Table 4), there was very little shift in position of preference between when the photos were viewed. The Spearman rank order correlation value (rho) was .96, indicating a high degree of association. Thus, variation in pattern of preference response for the forest trail scenes changed very little. The same scenes were preferred, only more so after the hike. This would again suggest that visitors had little difficulty in interpreting and responding to the photographs before the on-site hike. Thirdly, evidence from other studies that have compared preference ratings of the actual on-site environment with preference ratings of photographs has shown high correlations (Chapter II).

The degree to which preference was increased after the on-site encounter lends support to the suggestion that familiarity gained through on-site engagements may indeed lead to heightened preference and experience. It is proposed that the post-hike preference increase may be due to the on-site visual information and acquaintance acquired as a result of the on-site encounter. Hammitt (1981) suggests that increased preference serves as a

general quality indicator of recreation experience. The relationship of familiarity to visual preference is a topic discussed within the next chapter.

CHAPTER VI

FAMILIARITY

This chapter will present data concerning familiarity for the forest trail scenes. First, the individual scenes are examined to determine what types of forest trail scenes are remembered or recognized most and least by visitors. Next, the relationship of familiarity to visual preference is studied.

Each individual perceives the environment in a unique way, based on the past experiences they may have had. People relate to their surroundings through continuing reciprocal transactions, which can continue to produce new meanings. What we perceive is largely a function of our previous experiences, assumptions, and purposes (Eckbo, 1975).

Familiarity Ratings

Table 5 depicts the results from Treatment III. The mean familiarity rating for each photograph and rankings of the means and photos are presented. The overall mean familiarity rating for all 32 photographs was 3.51, suggesting visitors tended to remember having seen the scenes from their hike quite well.

Figures 8 and 9 show some of the most and least familiar scenes, respectively, based on familiarity ratings. Some interesting patterns emerge when one examines the scenes for elements which might strengthen or weaken familiarity. The most familiar scenes

Table 5. Familiarity Ratings for Forest Trail Scenes.[a]

Photograph No.	Familiarity Rating Mean	Rank of Means and Photos Mean	Photo No.
1	3.61	4.79	19
2	2.29	4.56	22
3	3.07	4.52	17
4	3.91	4.36	28
5	3.17	4.19	21
6	3.03	4.03	15
7	3.43	3.99	10
8	3.84	3.91	4
9	3.66	3.86	32
10	3.99	3.86	12
11	3.24	3.84	8
12	3.86	3.66	9
13	3.17	3.64	23
14	3.03	3.61	1
15	4.03	3.58	27
16	3.32	3.54	20
17	4.52	3.43	7
18	3.06	3.39	26
19	4.79	3.32	16
20	3.54	3.24	11
21	4.19	3.18	29
22	4.56	3.17	13
23	3.64	3.17	5
24	2.88	3.07	3
25	2.67	3.06	18
26	3.39	3.03	6
27	3.58	3.03	14
28	4.36	2.88	24
29	3.18	2.83	31
30	2.71	2.71	30
31	2.83	2.67	25
32	3.86	2.29	2

[a]Based on questionnaire ratings from Treatment III. ($\bar{x}$ = 3.51, N = 150)

Photo 19 $\bar{x}$ = 4.79

Photo 22 $\bar{x}$ = 4.56

Photo 21 $\bar{x}$ = 4.19

Photo 10 $\bar{x}$ = 3.99

Figure 8. Four of the eight most familiar forest trail scenes based on familiarity ratings.

Photo 2 $\bar{x}$ = 2.29

Photo 25 $\bar{x}$ = 2.67

Photo 18 $\bar{x}$ = 3.06

Photo 14 $\bar{x}$ = 3.03

Figure 9. Four of the eight least familiar forest trail scenes based on familiarity ratings.

are quite distinctive, identifiable, and as a consequence, visitors were quite positive as to whether they had viewed the scenes.

All four scenes in the study which included views of water were ranked within the top six scenes with respect to familiarity ratings. Photo 19, a view of Grotto Falls, the major destination of the visitor's hike, was the most familiar photograph in the study ($\bar{x}$ = 4.79).

Photos 22 and 10 are two distinct views of exposed tree roots along the trail. This aspect is uncommon on Trillium Gap Trail. The trail is maintained well by the National Park Service; however, high familiarity ratings for these scenes show how well visitors remember unpreferred, highly eroded scenes. Photo 21 is unique and identifiable likely due to the topography of the view. The trail climbs and winds its way around the steep grade in a distinct fashion. This type of scene is also uncommon elsewhere along the trail.

The least familiar scenes include views of ravines, tangled underbrush (photo 25), and scenes characterized by a lack of focus and coherence. By and large the visitors were unlikely to have paid much attention to these views.

It may be that a view of a ravine (photo 2) was not familiar to visitors because its photograph did not accurately portray enough elements of the scene. Shuttleworth (1980) has stressed that the field of the camera should be as great as possible and that as many depth cues as possible should deliberately be included in a

photographic composition to give an image that looks like the real scene. It was hypothesized by the researcher that the views of the ravines would be familiar to hikers since openings in the forest created by adjoining slopes would seem to be identifiable, distinct, and unique. However, the scope of openness and sloping terrain of ravine environments were difficult to capture in a photograph. The use of a wide-angle lens on the camera may have added additional depth cues and elements to the photograph, which could have caused scenes of ravines to become more familiar to visitors.

Photos 18 and 14 were likely not familiar to visitors because of their lack of focus. The scenes are simple; there is nothing really identifiable, distinct or unique about them. Photo 18 is a view of the forest from the side of the trail; rhododendron (Rhododendron maximum) flourishes in the foreground. Photo 14 is a picture of the trail proceeding straight through rather uniform, thick vegetation.

It is intriguing to know that visitors were so very cognizant of the visual information they had processed while engaged in a recreational activity. "The behavior of visitors while hiking the trail (or for that matter, participating in any other recreational activity) would lead one to believe they are just having a good time and the acquisition of information is the last thing taking place." Yet, information-processing theory predicts that visitors necessarily have an efficient cognitive system for "knowing" the natural environment (Hammitt, 1978).

Familiarity and Visual Preference Relationship

A positive relationship between familiarity and preference is suggested by the most familiar scenes. Of the fourteen most familiar scenes, eleven are also among the most preferred. However, of the eight most familiar views, two scenes (photos 22 and 10) are also among the eight least preferred. Figure 10 is a graphical depiction of the relationship between familiarity and preference. The diagram is based on ranked data in the far right columns of Tables 1 and 5, pages 26 and 46, respectively.

Basically, a linear, positive relationship is apparent in Figure 10. In most cases the scenes which are highly preferred are also highly familiar; and conversely, those scenes rated low in visual preference were also generally rated low in familiarity. A few scenes that are exceptions to this relationship, which have been previously mentioned, are worth noting. Photos 10 and 22 are highly familiar but low in preference. The exposed roots, although not visually preferred, are possibly acting as a unique, identifiable feature in the scene which could increase its familiarity. The disturbed roots also likely had importance to visitors as they experienced them on the trail hike. The data indicate that while preferred scenes are more likely to be familiar, the unique and distinct unpreferred scene is also likely to be remembered.

How might the relation between familiarity and preference be explained in terms of the information-processing model? The

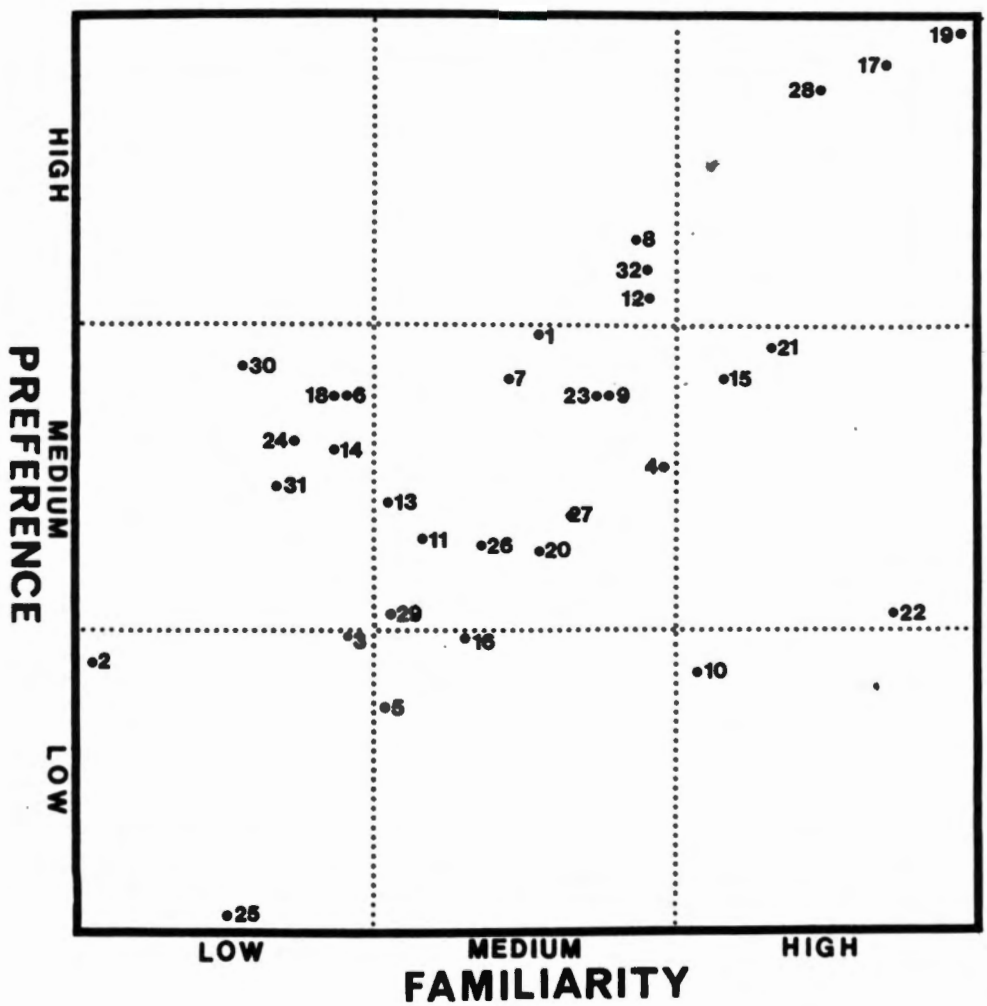


Figure 10. Relationship of visual preference to familiarity for photographs taken along a forest trail (n = 150; rho = .61). (Note: Numbers represent the photographs in Table 5, page 46, while the dots represent the preference and familiarity rank orders.)

model suggests that man is most comfortable, in a pleasurable state of mind, when in an environment that both causes little confusion (makes sense) and offers interesting information (cognitive involvement). In short, an environment is less likely to be preferred when there is little opportunity for involvement; the visitor could be expected to pay less attention or to pass more rapidly through the less preferred areas along the trail. Conversely, in preferred environments, he is likely to pay more attention and thus, increase contact and familiarity. Also, one

> prefers the scenes that are more identifiable and distinctive, that help in orientation, because distinctiveness is easier to remember. Thus, an environmental scene high in the cognitive domains of "distinctiveness" and "involvement" is more likely to be attended, and such sustained contact should enhance familiarity (Hammitt, 1978).

Various researchers have investigated the familiarity-visual preference relationship, but few involved a recreational environment or experience. Lynch (1960), in work involving the mental images of cities formed by individuals, found familiarity to be an important predicting variable. The number of environmental elements that became landmarks in an individual's image of a city depended as much upon how familiar the observer was with the surroundings as upon the elements themselves. Appleyard (1969), also having studied the urban environment, found that the appearance of buildings contributed greatly to remembrance for them. In a study involving methods similar to those used by Hammitt (1978) and this study, familiarity proved to be as important a predictor of preference

for urban places as the highly regarded component, visual complexity (Herzog et al., 1976). The authors contend that the rating of photographs for preference and familiarity serves to trigger or "call-up" an individual's concept or internal representation of that place; that the individual's response is not to the photographs per se but to a distillation of experience and knowledge about the place or scene depicted.

CHAPTER VII

VISITOR RESPONSE TO INTERPRETIVE SIGNS

A particular goal of this study was to determine whether or not interpretive signs placed along the trail would affect visual preference and familiarity ratings. It was hypothesized that the sign would capture the visitors' attention, cause them to ponder its message, and likely increase their preference and ability to remember the nearby scene.

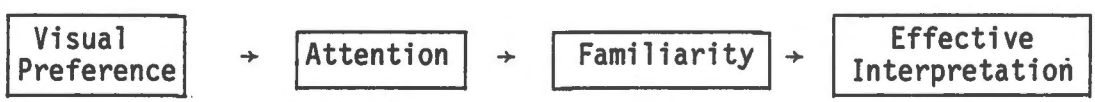
A principal objective of interpretation is to help the visitor to feel ". . . a sensitivity to the beauty, complexity, variety, and interrelatedness of the environment; a sense of wonder; a desire to know" (Wallin, 1975). Dr. J. Alan Wagar (1966) has stated: ". . . a final point with tremendous implications for quality is interpretation . . . through interpretation we can make each person's recreational experiences more meaningful and can make major attractions out of what seem to be very ordinary places." Interpretation can, indeed, raise the quality of visitor experiences, and is one way by which land management agencies can increase the flow of benefits they provide to the public (Field and Wagar, 1973).

Attention, Familiarity, Preference, and Interpretation

Attention and familiarity are important elements of effective interpretation. For an interpretive encounter to be effective, it must first capture our attention. Communications can occur only

when the intended onlookers pay attention to incoming information (Hammitt, 1982). Research in the area of persuasive communications has shown that a message's capacity to captivate and hold attention is fundamental to its effectiveness (Bettinghaus, 1968). The captured attention encourages extended contact with the message or encounter, which in turn leads to enhanced familiarity with the encounter. James (1962), in his treatment of attention and information processing, states that "the longer one does attend to a topic the more mastery of it one has."

Hammitt (1982) has theorized that a model may exist where scenes high in visual preference tend to attract our attention which, in turn, tends to enhance familiarity for those scenes and eventually, enhance interpretation. The relationship is conceptualized as follows:



> As an example, when an interpretive scene is not preferred due to its being non-distinct, featureless, and offering little opportunity for visitors to become visually involved, they might be expected to pay less attention or to pass more rapidly through such areas. In contrast, with preferred interpretive settings, visitors are likely to pay more attention and thus, increase contact and familiarity. Thus, interpretive situations high in the perceptual domains of distinctiveness and visual involvement are more likely to be attended, and such prolonged contact should enhance familiarity (Hammitt, 1982)

Benson and Ulrich (1981) and Hammitt (1982), in their visual preference research, have asked the question: "How would ratings

be affected if interpretive messages were located at certain scenes along a trail?" The purpose of this chapter is to investigate the influence interpretive messages (in the form of signs) had on the visual preference and familiarity ratings of hikers on the Trillium Gap Trail.

Favorability for Interpretive Signs

Signs are a popular form of media used in interpretation to convey information and to enhance the benefits received from interpretive experiences. The informational content of the message is able to draw the visitors' attention to interesting or unusual features and aspects of the trail environment which might otherwise be overlooked or not fully appreciated (Sharpe, 1976). Indeed, interpretive efforts are ineffective if they do not capture the visitors' attention (Wagar, 1974).

In order to "capture" the hiker's eye, an effort was made to provide interesting and revealing interpretation (not just labels or facts that may have been previously known) on an attractive sign which blended in with the environment. Each sign was constructed from redwood and plexi-glass and contained a brief (interpretive) message of two to three sentences and an illustrative sketch (Figures 11 and 12). Casings in the ground were used so signs could easily be removed on days when no signs were to be present. Ideas for sign construction and design were referred by U.S. Forest Service Misc. Publ. #968 (1964) and Lamoureaux and Lord (1978).

Figure 11. An example of an interpretive sign positioned along the side of the trail.

THE ROARING FORK

Once named "Watercreek Falls" by the oldtimers, this stream has the reputation of being the steepest and longest creek along the eastern seaboard.

Salamanders are quite common at this and other locations. Look carefully for them (without moving rocks or logs) and watch where you step! Don't touch these small creatures because they can be harmed easily. If you are lucky, you might even see a Red-cheeked Salamander which is found only within the Smokies.

Figure 12. An example of the text of an interpretive sign with an associated illustrative sketch.

To see how hikers' reacted to the presence of signs on the trail, they were asked to respond to the following questions (Treatments IV and V only):

1. About how many of the eight nature signs along the trail did you actually read while on your hike (not how many you saw)?

2. How did the presence of the nature signs along the trail affect your experience today?

The response format used for the questions was a 5-point Likert-type scale. Individuals responded "none, few, half, most, or all" for question 1, while response format for question 2 ranged from "detracted to a large degree" to "improved to a large degree."

Approximately 92% of the hikers said they read at least half of the signs along the trail, while a large majority (69%) indicated they read all of the signs (Table 6). Evidently the signs are attracting and capturing the attention of the visitors. Only 1% of the visitation purposely ignored the signs.

While it may be "socially acceptable" for visitors to report they read more signs than they actually did, other data collected in the study concerning visitor familiarity with the verbal content of the signs supports the findings that the majority of hikers did, indeed, read the signs. In addition, only eight signs were located along the trail.

Not only did many people read the signs, but 90% of them also felt that the presence of the signs improved their hiking experience (Table 7). Two percent of the hikers said the signs

Table 6. Number of Signs Read by Hikers.

Response Item	% of Response (N = 298)
None	1
Few	7
Half	6
Most	17
All	69

Table 7. Effect of Interpretive Signs on Hiking Experience.

Response Item	% of Response (N = 298)
Detracted to a Large Degree	0
Detracted Slightly	2
No Effect	8
Improved Slightly	37
Improved to a Large Degree	53

detracted slightly from their experience, while virtually none felt signs detracted greatly from their recreative activity.

Thus, results indicate that hikers reacted favorably to the presence of nature signs along the trail. Now, how were their visual preference (Treatment IV) and familiarity (Treatment V) ratings affected by the presence and associated, attention-catching, interpretive messages of the signs?

Influence of Signs on Visual Preference and Familiarity Ratings

Photograph Nos. 9, 20, 24, 25, and 27-30 are views of scenes in the study in which nature signs were positioned (signs were not photographed within the scenes). Table 8 shows the mean preference and familiarity ratings with (Treatments IV and V) and without (Treatments II and III) signs located at the eight treatment scenes along the trail.

In many cases both visual preference and familiarity significantly increased for those scenes where nature signs were located in close proximity. There are possible explanations for the few exceptions to this rule.

There was likely no change in preference or familiarity for photo 27 because visitors probably did not associate this scene with the interpretive message on the sign. The sign was erected in the foreground to the left of the trail (see Figure 11). Hikers likely didn't see this view as they read the sign and pondered its interpretive message.

Table 8. Influence of Nature Signs on Mean Preference and Familiarity Ratings.

Photograph No.	Preference Ratings T_2*	T_4 (Signs)	t test Signif.	Familiarity Ratings T_3	T_5 (Signs)	t test Signif.
9	3.77	4.00	.036	3.66	4.15	.001
20	3.30	3.66	.002	3.54	3.98	.001
24	3.66	3.93	.038	2.88	4.04	.000
25	2.27	2.67	.004	2.68	3.05	.020
27	3.43	3.54		3.58	3.52	
28	4.76	4.68		4.36	4.47	
29	3.22	3.45	.048	3.18	3.37	
30	3.86	4.07	.080	2.71	2.62	

*T_2 = ratings from Treatment II.

T_3 = ratings from Treatment III.

T_4 = ratings from Treatment IV.

T_5 = ratings from Treatment V.

Photo 28, a view of the stream, is a scene rated highly in both preference and familiarity. In fact, there is practically little space on the 5-point Likert scale for the photo to be rated significantly higher in either preference or familiarity. That is, there was little opportunity for the signs to have an influence on these already high ratings.

Photos 29 and 30 were both rated higher in preference in Treatment IV ($\alpha \lesssim .10$); however, there was no significant increase in familiarity in Treatment V. Photo 29, a view of the trunk of a felled tree along the side of the trail, may not have been familiar to visitors because of the close-up framing of the photo. It may be that not enough depth cues and elements of the scene are present to provide adequate cognitive recall of the view. Photo 30, a highly preferred view of a ravine, is peculiar in terms of its familiarity rating. For some strange reason, hikers appear to think that this scene does not exist on the Trillium Gap Trail. Its low familiarity ratings, with or without signs, are evidence that this photo might also lack enough depth cues and elements of the scene to accurately depict the view seen by the eyes of the hiker. If the photo contained the trail, in the foreground, bending around the ravine, perhaps this scene would have been more familiar to hikers. The use of a wide-angle lens on the camera might have been helpful.

For those scenes in which a significant increase occurred in visual preference and/or familiarity, the difference is likely due to the presence of nature signs and their associated interpretive

messages. The sign captures the visitors' attention; they read and ponder its interpretive message, causing prolonged contact with the immediate environment, and thus increasing their visual involvement and familiarity for the scene they are viewing. Increased visual involvement should be a factor in enhancing both preference and familiarity for an environment.

Even photo 25 (a view of tangled underbrush), the least preferred scene in the study, significantly increased in terms of preference and familiarity following visitors' exposure to an interpretive sign at that location. The message on the sign dealt with the beneficial aspects of the tangled underbrush for wildlife. The pile of logs, twigs, and leaves could be used for shelter by small birds in a snowstorm or for cover by chupmunks being chased by a predator. Thus, it is shown that interpretation can increase peoples' perceptions and preferences for otherwise, visually non-preferred areas. This can be quite beneficial from a managerial perspective.

CHAPTER VIII

BACKGROUND VARIABLES

It is a general practice of any study of this nature to observe the possible effects that background variables may have on results. That is, do variables such as hiking experience, hiking group size, residence, age, education, and occupation affect visual preference ratings?

One-way analyses of variance and/or Chi-Square tests were applied for each background variable in the questionnaire (see Plate 1, In Pocket). These tests can tell the researcher, for example, if experienced hikers rate photos for preference significantly different from inexperienced hikers, or if younger people prefer scenes on the trail significantly more than older people. For each background variable, few (9% of all cases) significant, interpetable differences were discovered (Table 9). These results are not surprising for visual preference research, although hiking experience (at Trillium Gap Trail) could possibly have depicted a significant difference if a larger percentage of repeat visitors were sampled.

It is difficult to interpret the few significant differences found within the travel mileage, education, and job status variables. Visitors traveling less than 250 miles to the "Smokies" preferred scenes in the "FOREGROUND CLUSTER" dimension the most; visitors traveling more than 400 miles preferred these scenes significantly less, and those who traveled between 250 and 400 miles rated the

Table 9. Effects of Background Variables on Visual Preference Themes.[a]

Background Variable	F Ratio			
	Water	Trail	Ravines	Foreground Cluster
Hiking Experience	2.63	0.47	0.03	0.04
"Smokies" Visiting Experience	0.11	1.72	2.44	1.51
"Smokies" Hiking Experience	0.08	0.55	0.98	1.10
Time Spent Hiking	0.82	0.11	2.31	0.42
Taking Photographs	0.01	1.02	3.41	0.01
Group Size	2.58	0.13	0.56	0.45
Residence; Rural vs. Urban	2.00	0.40	0.72	0.69
Travel Mileage	1.18	0.68	2.32	7.72**
Age	0.01	0.36	0.15	1.72
Education	1.05	3.36*	2.94*	1.85
Job Status	2.04	4.37*	1.22	0.48

[a]Based on questionnaire ratings from Treatment II (N = 150).

*Significant at $\alpha \leq .05$.

**Significant at $\alpha \leq .001$.

scenes the lowest. When observing the education variable, those visitors with at least a high school diploma rated scenes of the trail and ravines significantly higher than those with either a college diploma or less than 12 years of schooling. Those hikers with high scores on the job status scale rated scenes in the "TRAIL" dimension significantly lower. These individuals probably work in predominantly urban environments, and the trail might be representing a path too rustic for their preferences. In summary, few, if any, interpretable, significant differences were found when testing background variables across visual preference ratings.

Benson and Ulrich (1981) showed, that although viewer panels represented a wide variety of interests, from school teachers to forestry students to timber industry representatives, scenes were ranked in the same order of relative like or dislike in virtually every evaluation, regardless of the group. Very similar results were reported by Daniel and Boster (1976) in a comparison of 26 different groups. In addition, Wellman and Buhyoff (1980) also found that groups with varying orientations toward natural landscapes have been shown to exhibit strong similarities in their preferences, suggesting that generic landscape preference models may be viable.

To test for differences among treatment groups, appropriate statistical tests (Student t tests and Chi-square) were exercised across all treatments for every background variable, and no significant differences were found ($\alpha \leq .05$). Thus, a comparison of visitor characteristics within all treatments shows strong similarities.

CHAPTER IX

MANAGEMENT IMPLICATIONS

The purpose of this chapter is to discuss some general implications based on the results of this study, and to suggest ways in which these implications could be used in the planning, developing, and managing of visual resources to provide and better meet the needs of outdoor recreationists.

Knowledge of what types, aspects, and patterns of forest scenes visitors prefer to see permits the resource manager to locate trails on a basis other than intuition or geological site characteristics. Often, trail location is based on what the resource manager or interpretive specialist feels is most interesting (Hammitt, 1980b). Locating trails by incorporating user preference information should enhance the total benefits derived from the recreational experience.

Preferred scenes can become "nodes" along and through which to structure and design trails. Such scenes represent areas of high visitor interest. If these areas of high interest can be predetermined or predicted, then a trail can be planned to be built around them (Hammitt and Cherem, 1980).

Of particular interest to visitors in this study were scenes of water, ravines, and the luring opportunity to explore for additional information within the environment. Mystery, the promise of suggested but hidden information, is a component that rates high in the forest, and the trail offers easy access for its exploration.

Concerning the perception and management of trail environments, the preference of hikers for small streams and ravines implies that trail planners should inventory potential trail areas for these landscape features before designing trail routes. Many trails in natural areas appear to be "destination" oriented; the objective is to get the visitor to the waterfall or main attraction for which the trail is planned. However, it should be noted by managers and others involved in trail planning that small streams of cascading water are a strong visual preference of visitors, and not just the unique destination feature of many trails. By designing trail routes to include streams, ravines, and other visually preferred features, the visual benefits of trail experiences should be enhanced.

The visual preference of hikers for scenes that included a segment of trail suggests that visitors do not view trails as intrusions upon the natural environment, but as a preferred component. Trails serve as a clearing, a vista, which allow visitors to explore forest environments visually as well as physically. As shown in previous studies (Hammitt, 1980a), those trail scenes which included a bend in the trail and thus, obscuring the vision of what lies around the corner, were preferred over straight segment trails.

Scenes including the "mystery" component encourage hikers to walk around the bend of the trail, to explore. An important element of the hidden view effect is the presence of dense vegetation, a land form, or some visual barrier. Lay-out of trails to

include bends where vision is obscured by dense vegetation and land forms can create the effect desired (Hammitt, 1980a). Management of the understory shrub vegetation by periodic cutting of canopy trees to allow light to the forest floor might be advisable in certain locations to maintain a dense vegetative barrier.

Visitors reacted quite favorably to the presence of nature signs and their associated interpretive messages when located along the trail. For those photos in which visitors were able to relate the scene to the interpretive message on the sign, both visual preference and familiarity ratings significantly increased. Evidently, the visitor's attention is captured by the sign; he or she ponders its interpretive message, while viewing his immediate surroundings; this causes prolonged contact with the area, and thus enhances preference and familiarity for the scene.

Recognizing that interpretive services can sometimes improve peoples' preferences, especially for disturbed landscapes, interpreters could design programs that dealt with topics and associated scenes which people do not prefer, but which managers feel are nonetheless important from a management perspective. An example might be a sign interpreting a timber-harvested area. The area would likely be unpreferred, but the sign could discuss the ability of both the vegetation and aesthetics of the scene to recover over time. It might also discuss the diversity of habitats offered to wildlife by the "cut" or the ever popular "edge concept." This would be beneficial to resource managers in helping the public to

accept multiple-use management practices (Hammitt, 1981). In this study, an otherwise unpreferred and unfamiliar scene of tangled underbrush (photo 25) significantly increased in both preference and familiarity ratings when an interpretive nature sign was placed at that location along the trail.

A major objective of recreation resource managers should be to conduct a field inventory in forest trail environments to find features preferred by visitors before the trail location is determined. While the photo-questionnaire technique is well adapted to the determination of what is interesting to hikers on trails already established, it also has a potential function in the design of new trails. When designing new trails, a necessary first step would be to field survey and inventory the potential trail environment for distinct features, streams, ravines, views containing complexity and/or mystery, and other preferred components. Photos of a diverse assortment of scenes from the area could then be rated by various civic groups or visitors to an agency's information center. Photographic preference results from studies on established trails in similar environments also can provide useful preference predictors for designing new trails. Certainly new forest trails can be laid out to include views of water and ravines where possible, and bends or corners where vision is obscured by dense vegetation or land forms to produce the desired element of mystery. Existing as well as new trails designed with this visitor perception methodology should enhance hiking experiences.

The use of a photo-questionnaire to study the visual preferences of on-site visitors was received quite favorably by respondents. The fact that the photo-questionnaire technique is quite inexpensive, requires little statistical software and is an approach that involves the public in the management of visual resources should promote its further use.

CHAPTER X

SUMMARY AND CONCLUSIONS

The purpose of this study was to determine the visual preferences of visitors to a forest trail environment in Great Smoky Mountains National Park, Gatlinburg, Tennessee.

The general scope of the study relates to people's perception of natural environments during recreational engagements. Of particular interest was how people perceive forest trail environments and how recreation resource managers might better plan, design, and manage these to meet the preferences of visitors. Specific objectives aimed at assisting the resource manager were:

1. Identify possible forest trail landscape patterns, components, and features of scenes that tend to be preferred. Also of interest was the change in preference as a result of contact with the setting through an on-site experience.
2. Determine the relationship between preference and familiarity, and whether preferred scenes are more easily remembered by visitors.
3. Observe the effect of interpretive signs placed along the trail on preference and familiarity ratings.
4. Determine if visitors with different past experiences and backgrounds view the forest trail environment differently.

5. Apply the results to recreation resource management and interpretation based on the features, patterns, and components identified as most preferred by visitors.

The research was based on a particular theoretical approach which assumes that man is an information processing organism of his environment. As such, various environments or components of environments contain different information and are preferred on the basis of the information they offer. This approach underlies the interpretation of the visitors' preferences and led to general and specific resource management recommendations.

Some Results

Preference ratings of the photographs showed that visitors generally rated the forest trail environment fairly high, but they do have definite preferences for certain features and scenes along the trail. Of particular interest to visitors in this study were scenes of water, ravines, and the luring opportunity to explore for additional information within the environment. Mystery, the promise of suggested but hidden information, is a component that rates high in the forest, and the trail offers easy access for its exploration.

Based on the preference ratings, a factor analysis procedure identified four dimensions or themes of commonalities underlying the forest scenes. The most highly preferred dimension contained scenes of water. Other preferred dimensions included scenes of

the trail and ravines. Least preferred were photographs of felled trees, tangled underbrush, and exposed roots. A comparison of the preferred scenes with the unpreferred shows a striking difference in terms of opportunities for cognitive involvement, as predicted by the information processing model.

If visitors viewed photographs before they hiked the trail, their ratings of the photos were similar to those who rated the scenes after their hike; the only difference being that the post-hike ratings were almost all slightly higher. This increase in preference ratings was likely a result of contact with the setting through an on-site experience.

Familiarity ratings indicated that visitors were quite cognizant of what scenes they had seen on their on-site hike. The effect of repeat-visitation could not be examined, since predominantly most hikers were first-time visitors. The most familiar scenes seemed to contain unique and identifiable features. Preference was shown to be closely related to familiarity, assuming visitors were able to recognize the photo in the questionnaire as a scene along the trail. Thus, considerable visual information is being processed and recorded by visitors during an on-site recreational experience.

Interpretive signs, located at certain scenes, were shown to significantly increase preference and familiarity ratings in many instances. This is likely due to greater attention to and contact with the scene; visitors pondering interpretive messages are apt to spend more time in areas containing nature signs.

Differences due to visitors' hiking experience and background characteristics had no effect on visual preference ratings. Other visual preference research supports this finding.

Implications

The results of this study imply that, where possible, forest trails should be designed to take visitors to views of streams and ravines; the trail should be laid out to provide diverse viewpoints of these preferred scenes. Bends in the trail where vision is obscured by dense vegetation and land forms can provide a preferred visual image termed "mystery." Mystery, the promise of suggested but hidden information, is a component that rates high in the forest, and the trail offers easy access for its exploration.

Increased preference and familiarity ratings for scenes where an interpretive sign was positioned suggest that interpretation can be used as an effective management tool on forest trails. Interpreters can provide messages on signs that deal with topics and associated scenes which people do not prefer but which resource managers feel are nonetheless important from a management perspective.

A visual preference approach appears to be an effective procedure for recreation resource managers to assess the preferences of visitors. Knowledge of what types, aspects, and patterns of forest scenes visitors prefer to see permits the recreation resource manager to locate trails on a basis other than intuition or geologic site characteristics. If preferred scenes (areas of high visitor

interest) can be predetermined or predicted, then a trail can be planned to be built around them. Developing trails through the incorporation of user preference information should help managers better meet the needs of recreationists.

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